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TRANSACTIONS

OF THE

AMERICAN

ENTOMOLOGICAL SOCIETY,

AND

PROCEEDINGS

OF THE

ENTOMOLOGICAL SECTION

OF THE

ACADEMY OF NATURAL SCIENCES.

VOL. XV.

PHILADELPHIA:

PAUL C. STOCKHAUSEN, ENTOMOLOGICAL PRINTER.

1888.

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PROCEEDINGS

OF THE

MONTHLY MEETINGS

OF THE

ENTOMOLOGICAL SECTION

OF THE

ACADEMY OF NATURAL SCIENCES,

PHILADELPHIA.

JANUARY 26, 1888.

Director Dr. HORN in the chair.

The following additions to the Library of the American Entomological Society were announced:

Entomologia Americana, vol. iii, Nos. 9 and 10. From the Editor.

Canadian Entomologist, vol. xx, No. 1. From the Editor.

Transactions of the Kansas Academy of Sciences, vol. x, 1885–86. From the Academy.

Bulletin of the Essex Institute, vol. xix, Nos. 1–3. From the Institute.

Bulletin of the Washburn College Laboratory of Natural History, vol. ii, Nos. 7 and 8. From the Laboratory.

Entomologist's Monthly Magazine, Dec. 1887 and Jan. 1888. From the Conductors.

Le Naturaliste Canadien, vol. xvii, Nos. 4 and 5. From the Editor.

Annales de la Société Entomologique de France, 6e sér. tome vi, 1886. From the Society.

Bulletin de la Société Imperiale des Naturalistes de Moscow, 1887, No. 3. From the Society.

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Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien, vol. xxxvii, Nos. 1 and 2. From the Society.

Mittheilungen der Schweizerischen Entomologischen Gesellschaft, vol. vii, No. 7. From the Society.

The Sphingidæ of New England, by C. H. Fernald. From the Author.

The Butterflies of Maine, by C. H. Fernald. From the Author.

The Butterflies of North America, by Wm. H. Edwards, 3d ser. Parts 1–3. From the Author.

The Entomological Writings of Dr. Alphonso Spring Packard, by Samuel Henshaw. From Prof. C. V. Riley.

The North American Callimorphas, by H. H. Lyman. From the Author.

A new genus and species of Arctiidæ—A new Sphinx—Notes on Diludia, G. & R.—New genera and species of North American Noctuidæ, by J. B. Smith. From the Author.

Studies on the North American Proctotrupidæ, with descriptions of new species from Florida, by Wm. H. Ashmead. From the Author.

Notes on the mode of pollination of Asclepias, by Charles Robertson. From the Author.

Annual Report of the Curator of the Museum of Comparative Zoology at Harvard College for 1886–87. From the Museum.

The Study of History in American Colleges and Universities, by H. B. Adams. From the Bureau of Education, Washington, D. C.

Recherches Expérimentales sur la vision chez les Arthropodes. Parts 1–2, par Félix Plateau. From the Author.

Catalogue d'Acridiens, par A. Pictet and H. de Saussure, I. From the Authors.

Spicilegia Entomologica Genavensis scripsit H. de Saussure, II. Tribu des Pamphagiens, 1887. From the Author.

Die Hymenopteren-Gattung *Gasteruption* Latr. (*Fœnus* Aut.) und *Evania* Fabr.—Zwei neue Arten des Hymenopteren-Gattung *Evania*, von August Schletterer. From George B. Cresson.

Die Metamorphose zweier Arten der Gattung *Anacharis* Dalm. von Anton Handlirsch. From George B. Cresson.

Synopsis of the Families and Genera of the Hymenoptera of America North of Mexico, by E. T. Cresson. From the Author.

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Mr. J. F. Knight reported from Finance Committee that they had examined the accounts of Treasurer of Section and found them correct.

Report of Curator was read and accepted.

A communication from the Smithsonian Institution announcing the selection of Prof. S. P. Langley as secretary.

A paper was read from Dr. E. Brendel entitled: "Some corrections in the family Pselaphidæ," and the Publication Committee was authorized to print without delay.

Paper 206 was read by title and referred to Publication Committee.

Mr. Knight was called to the chair and Dr. Horn gave fuller details of the characters of Lachnosterna from his paper which had been printed.

Five species of Pleocoma were exhibited, and an explanation of their systematic position in the family Scarabæidæ given. Dr. Horn denied the assertion of Dr. Gerstaecker that they were Pleurostict, and demonstrated by dissections that Dr. LeConte had correctly placed them in the Laparostict series.

Dr. Horn exhibited a drawing of the larva of *Glyptus* found in the nests of the great white ant in Sierra Leone.

After a discussion on the availability and utility of Alaska as a collecting field, the Section, at 9.35, adjourned.

FEBRUARY 23, 1888.

Director Dr. HORN in the chair.

The following additions to the Library of the American Entomological Society were announced:

Transactions of the American Entomological Society vol. xiv, No. 2. From the Publication Committee.

Memoirs of the Boston Society of Natural History, vol. iv, Parts 1–4. From the Society.

Psyche, vol. v, Nos. 141–142, Jan.–Feb. 1888. From the Cambridge Entomological Club.

Entomologist's Monthly Magazine, February, 1888. From the Conductors.

Journal and Proceedings of the Royal Society of New South Wales, vol. xx, 1886. From the Society.

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Butterflies of North America, Third Series, Part 4, by Wm. H. Edwards. From the Author.

Le Naturaliste Canadien, vol. xvii, No. 8. From the Editor.

Deutsche Entomologische, Zeitschrift, vol. xxxi, Part 2. From the Society.

Bulletino della Société Entomologica Italiana, 1887, Nos. 3–4. From the Society.

The Publication Committee reported that since their last report the paper of Dr. Horn entitled: "Revision of the species of Lachnosterna of America north of Mexico" had been entirely completed Action approved.

Papers 207, 208 and 209 were read by title and referred to Publication Committee.

Mr. Wells presented three specimens of *Pamphila dera* for the cabinet.

Dr. Horn exhibited a phototype plate on which twelve specimens of *Pleocoma* were figured, three of them females, representing seven species. It was further stated that a full description of *Pleocoma* would be given with the view of answering Dr. Gerstaecker's criticism of LeConte's work. A number of drawings were exhibited, which it was proposed to publish shortly.

Dr. Horn also exhibited specimens of what he had no doubt were the larvæ of *Platypsylla* received recently from a friend in Texas. In this larva the mandibles are very distinct, but in the imago are entirely absent. The well developed maxillæ enable it to obtain food. Sketches of details were shown which, for better illustration, were enlarged on the blackboard. Adjourned 9.20.

March 22, 1888.

Director Dr. Horn in the chair.

The following additions to the Library of the American Entomological Society were announced:

Proceedings of the Academy of Natural Sciences, 1887, Part 3. From the Academy.

Entomologist's Monthly Magazine, March, 1888. From the Conductors.

Entomologica Americana, March, 1888. From the Editor.

Psyche, vol. v, No. 143, March, 1888. From the Cambridge Entomological Club.

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Bulletin de la Société Imperiale des Naturaliste de Moscow, 1887, No. 4. From the Society.

Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien, vol. xxxvii, Nos. 3–4. From the Society.

Biologia Centrali-Americana: Coleoptera, vol. ii, pt. 1, pp. 137–168, pl. 4; pt. 2, pp. 177–200; vol. vi, pt. 1, pp. 601–625, pl. 33. Hymenoptera, pp. 449–456, pl. 19. Rhopalocera, pl. 58. By purchase.

The Publication Committee reported in favor of publishing paper 207 entitled: "The species of Pleocoma with a discussion of its position" by Geo. H. Horn, M. D.; also paper 208 entitled: "Some coleopterous larvæ," by Geo. H. Horn, M. D. Publication accordingly ordered.

Dr. Horn announced that, by permission of the Academy, the rooms of the Section may be opened during four Mondays of each month until 10 p. m.

Mr. Ridings moved that thirty dollars be appropriated for the services of the Academy's janitor.

Dr. Horn exhibited a dissection of the abdomen of *Pleocoma* spread between glass showing the position of the spiracles.

Dr. Horn spoke of the difficulty in properly defining *Allecula* and *Hymenorus*.

Dr. Skinner spoke of the previous opinions which had been expressed regarding the manner of emergence of a moth from the cocoon. In the case of the "Luna" the insect cuts its way through the base by serrated projections arising from the base of the forewings by means of which a circular opening was made. Adjourned 9.25.

April 26, 1888.

Director Dr. Horn in the chair.

The following additions to the Library of the American Entomological Society were announced:

Canadian Entomologist, vol. xx, Nos. 2–3. From the Editor.

Entomologica Americana, vol. iv, No. 1. From the Editor.

Proceedings of the Entomological Society of Washington, vol. i, No. 2. From the Society.

Proceedings of the Linnean Society of New South Wales, 2d ser. vol. ii, Part 3. From the Society.

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Journal of the Elisha Mitchell Scientific Society, 1887. From the Society.

Berliner Entomologische Zeitschrift. Zweites Heft, 1887. From the Society.

Synopsis of the Aphidæ of Minnesota, by O. W. Oestlund. From the Author.

Synopsis of the North American Syrphidæ, by S. W. Williston. From the Author.

Prodromus of the Zoology of Victoria, by Frederick McCoy, Decade i–xiv. From the Government of Victoria.

Recherches Expérimentales sur la vision chez les Arthropodes, Part 3, par F. Plateau. From the Author.

Expériences sur le role des palpes chez les Arthropodes maxillés—Troisième et dernière parte—Organes palpiformes des Crustacés, par Felix Plateau. From the Author.

Publication Committee reported in favor of publishing paper 209, entitled: "Monograph of the Sphingidæ of North America" by John B. Smith; also paper 210, entitled: "Miscellaneous Coleopterous Studies" by Geo. H. Horn, M. D. Publication ordered.

Mr. Liebeck, on behalf of Mr. Wenzel, announced the recent capture, near the city, of *Elater discoideus* and *E. collaris*.

Dr. Horn gave some details of a recent study of *Eustrophus*, noting the fact that in *bicolor* the hind tibiæ had well marked transverse ridges, while in *repandus* n. sp. they were entirely absent. Two species formerly placed in *Eustrophus* were removed to *Holostrophus* n. g. Other points in the general arrangement of Melandryidæ were also dwelt upon.

Dr. Skinner, in referring to his remarks at the preceding meeting, said that the armature at the base of the forewing of "Luna" had been called "sector cocouis" by Dr. Packard.

Mr. Westcott was admitted as an associate member. Adjourned 9.45.

MAY 24, 1888.

No quorum being present the meeting adjourned.

The following additions to the Library of the American Entomological Society were announced:

Memoirs of the Boston Society of Natural History, vol. iv, Nos. 5–6. From the Society.

Entomologica Americana, vol. iv, No. 2. From the Editor.

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Canadian Entomologist, vol. xx, Nos. 4–5. From the Editor.

Bulletin of the Museum of Comparative Zoology at Harvard College, in Cambridge, vols. xiv–xv. From the Museum.

Bulletin of the Ohio Agricultural Experiment Station, 2d ser. No. 3. From C. M. Weed.

Psyche, vol. v, Nos. 144–145. From the Editor.

Proceedings of the Zoological Society of London, 1887, Part 4. From the Society.

Transactions and Proceedings and Report of the Royal Society of South Australia, vol. xiv. From the Society.

Entomologist's Monthly Magazine, April-May, 1888. From the Conductors.

Entomologische Zeitung, herausgegeben von dem Entomologischen Vereine zu Stettin, 1887. From the Society.

The Orthoptera of New England, by C. H. Fernald. From the Author.

Rhopalocera Nihonica—a description of the Butterflies of Japan, by H. Pryer, Part 1. By purchase.

A contribution to the study of the Morphology of the Chalcididæ, by L. O. Howard. From the Author.

On some new or little known British Parasitic Cynipidæ, by P. Cameron. From the Author.

Species des Hyménoptères d'Europe and 'Algérie, par Ed. Andre, Fasc 27–29, April, 1888. From the Author.

Matériaux pour la Faune Entomologique de la Province du Brabant—Coléoptères, quatrième Centurie, par A. P. de Borre. From the Author.

JUNE 11, 1888.

E. T. CRESSON in the chair.

The following additions to the Library of the American Entomological Society were announced:

Proceedings of the Academy of Natural Sciences of Philadelphia, 1888, Part 1. From the Academy.

Canadian Entomologist, vol. xx, No. 6. From the Editor.

Bulletin of the Essex Institute, vol. xix, Nos. 4–12. From the Institute.

Entomologica Americana, vol. iv, No. 3. From the Editor.

Entomologist's Monthly Magazine, June, 1888. From the Conductors.

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Deutsche Entomologische Zeitschrift, 1888, Heft 1. From the Society.

Verhandlungen des naturhistorischen Vereines, vol. v, No. 4. From the Society.

Butterflies of North America, by Wm. H. Edwards, 3d ser. Part 5. From the Author.

Biologia Centrali-Americana: Coleoptera, vol. ii, pt. 1, pp. 169–176, pl. 16; pt. 2, pp. 201–216, pl. 10–11; vol. vii, pp. 49–72, pl. 3. Hymenoptera, pp. 457–466. Diptera, vol. ii, 1–40, pl. 1–2. By purchase.

Publication Committee announced that since January there had been 128 pages of the Transactions printed.

Mr. Seeber announced the recent capture of *Saperda puncticollis* on Rhus toxicodendron.

After some general remarks on collecting the Section, on motion of Mr. Blake, adjourned until September. Adjourned 9.10.

SEPTEMBER 27, 1888.

E. T. CRESSON in the chair.

The following additions to the Library of the American Entomological Society were announced:

Proceedings of the Boston Society of Natural History, vol. xviii, sig. 29–35; vol. xix, sig. 1–2. From the Society.

Bulletin of the Museum of Comparative Zoology, vol. xviii, Nos. 9–10. From the Museum.

Canadian Entomologist, vol. xx, Nos. 6–9. From the Editor.

Entomologica Americana, vol, iv, Nos. 4–6. From the Editor.

Psyche, vol. v, Nos. 146–148. From the Cambridge Entomological Club.

Journal of the Trenton Natural History Society, No. 3, January, 1888. From the Society.

Eighteenth Annual Report of the Entomological Society of Ontario, 1887. From the Society.

Proceedings of the Zoological Society of London, 1888, Part 1. From the Society.

Entomologist's Monthly Magazine, Nos. 290–292. From the Conductors.

Journal of the Linnean Society of London, Nos. 118, 130, 131, 136–139, 1887–1888. From the Society.

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Journal of the Royal Society of New South Wales, vol. xxi, 1887. From the Society.

Annual Report of the Smithsonian Institution, 1885, Part 2. From the Institution.

Periodical Bulletin of the Division of Entomology, U. S. Department of Agriculture, vol. i. Nos. 1–2. From the Department.

Bulletin No. 15 of the Division of Entomology, U. S. Department of Agriculture. From the Department.

Bulletin of the Hatch Experiment Station of the Massachusetts Agricultural College, No. 1, July, 1888. From Prof. C. H. Fernald.

Bulletin of the Ohio Agricultural Experiment Station, No. 4, 2d ser. July, 1888. From C. M. Weed.

Bulletin of the Experiment Station of the Kansas Agricultural College, No. 3, June, 1888. From E. A. Popenoe.

Le Naturaliste Canadien, vol. xvii, Nos. 11–12; vol. xviii, Nos. 1–3. From the Editor.

Annales de la Société Entomologique de France, 1887, Nos. 1–4. From the Society.

Berliner Entomologische Zeitschrift, Band xxxii, No. 1. From the Society.

Verhandlungen der kaiserlich-königlichen zoologisch-botanischen Gesellschaft in Wien, Band xxxviii, Nr. 1–2. From the Society.

Mittheilungen der Schweizerischen Entomologischen Gesellschaft, Band vii, Nr. 10; viii, Nr. 1. From the Society.

Memoirs de la Sociedad Cientifica Antonia Alzate, Tome i, Nr. 1–12. From the Society.

Archives do Museu Nacional do Rio de Janeiro, vol. vii. From the Museum.

Annulario del Museo Zoologico della r. Universita di Napoli. Anno. ii. From the University.

Descriptions of twenty-three new species of Hymenoptera, by P. Cameron. From the Author.

Nesting Habits of the American Purseweb Spider, by Rev. H. C. McCook. From the Author.

New Genera and Species of Epipaschiæ and Phycitidæ, by Geo. D. Hulst. From the Author.

Address by C. V. Riley before the Section of Biology, American Association for Advancement of Science, August, 1888. From the Author.

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Remarks on the Insect Defoliators of our Shade Trees—Poisonous Insects—The Song Notes of the Periodical Cicada—The Hessian Fly an imported insect—The Problem of the Hop-plant Louse (Phorodon humuli) in Europe and America—On the Luminous Larviform Females in the Phengodini, by C. V. Riley. From the Author.

The following were by purchase:

Lepidoptera Exotica, or descriptions and illustrations of Exotic Lepidoptera, by A. G. Butler, 1869–1874; 1 vol.

Catalogue of Diurnal Lepidoptera of the Family Satyridæ in the Collection af the British Museum, by A. G. Butler, 1868; 1 vol.

Etudes d'Entomologie. Faune des Lepidoptères d'Algérie, par Charles Oberthür, 1876.

Enumeratio Corporum Animalium Musei Imperialis Academiæ Scientiarum Petropolitanæ. Pars 1–2, Lepidoptera Diurna and Heterocera, 1855–57.

Biologia Centrali-Americana: Coleoptera, vol. ii, Part 1, pp. 177–208; Part 2, pp. 217–296, plates 12–15; vol. iv, Part 1, pp. 385–408, pl. 17; vol. vi, Part 1, Suppl. pp. 1–40, pl. 34–35; vol. vii, pp. 73–88, pl. 4.

Papers 211 and 212 were read by title and referred to Publication Committee.

Mr. Liebeck announced that he had recently collected *Mecynotarsus candidus* running about on plowed ground near Westville, N. J. The insect had not been previously collected north of Fortress Monroe.

Mr. Ashmead exhibited drawings of the larvæ and imago of a Hymenopterous insect recently studied, which he proposes to describe as *Kormus maidis*. Drawings of *Aleurodes citri* were also shown.

After conversation the Section adjourned at 9.45.

October 25, 1888.

Director Dr. Horn in the chair.

The following additions to the Library of the American Entomological Society were announced:

Transactions of the American Entomological Society, vol. xv, Nos. 2–3, 1888. From the Publication Committee.

Canadian Entomologist, vol. xx, No. 10, October, 1888. From the Editor.

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Bulletin of the Illinois State Laboratory of Natural History, vol. ii, Art. 1, 2, 3, 5, 6 and 7; vol. iii, Art. 2–4. From the Laboratory.

Bulletins 10 and 11 of the Division of Entomology, U. S. Department of Agriculture. From the Department.

Bulletin of the Hatch Experiment Station of the Massachusetts Agricultural College, No. 2. From Prof. C. H. Fernald.

Transactions of the Entomological Society of London, 1887. From the Society.

On the Chinch-Bug—Arsenical Poisons for the Codling Moth, by S. A. Forbes. From the Author.

The Publication Committee reported in favor of publishing paper 211, entitled: "Diptera Brasiliana ab H. H. Smith collecta" by S. W. Williston; also 212, entitled: "Description of the larva of *Papilio Gundlachiana* two days before its transformation into a chrysalis" by Alfred Benzon. Publication ordered accordingly.

The donation of a number of Hymenoptera to the cabinet of the American Entomological Society by L. O. Howard, on behalf of the U. S. National Museum, was announced.

Dr. Horn announced the addition to the Wilt collection of a number of species not formerly reported.

Papers 213, 214, 215 and 216 were read by title and referred to Publication Committee.

Dr. McCook spoke of the difficulty in observing spiders owing to the continuous wet weather. He desired from members information as to those insects "feigning death" when disturbed.

Dr. Horn spoke of the examination of types of North American insects in European museums. The differences between so called types and their descriptions were sometimes so great as to be very puzzling. Among the Chrysomelidæ Mr. Jacoby had investigated several types and the results would be presented to our Section for publication; also Mr. C. J. Gahan had reviewed several Cerambycidæ with useful results.

After a discussion of "types" and their value the Section, at 9.30, adjourned.

NOVEMBER 22, 1888.

Director Dr. HORN in the chair.

The following additions to the Library of the American Entomological Society were announced:

Proceedings of the Academy of Natural Sciences, 1888, Part 2. From the Academy.

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Entomologica Americana, vol. iv, No. 7–8. From the Editor.

Canadian Entomologist, vol. xx, No. 11. From the Editor.

Bulletin No. 19 of Division of Entomology, U. S. Department of Agriculture, 1888. From the Department.

Periodical Bulletin of Division of Entomology, U. S. Department of Agriculture, vol i, Nos. 3–4. From the Department.

Entomologist's Monthly Magazine, October and November, 1888. From the Conductors.

Psyche, vol. v, Nos. 149–150. From the Cambridge Entomological Club.

Proceedings of the Zoological Society of London, 1888, Part 3. From the Society.

Le Naturaliste Canadien, vol. xviii, No. 4. From the Editor.

Annales de la Société Entomologique de Belgique, vol. xxxi, 1888. From the Society.

Bulletin de la Société Imperiale des Naturalistes de Moscou, 1888, Nos. 1–2. From the Society.

Horiæ Societatis Entomologicæ Rossicæ, vol. xxi, 1887. From the Society.

Verhandlungen des naturhistorischen Vereines der preussichen Rheinlande, etc., ser. 5, vol. v, Nr. 1. From the Society.

Report of the Entomologist, C. V. Riley, for 1887. From the Author.

Matériaux pour la Faune Entomologique de la province de Liége, 4e centurie, et Luxembourg belge, 3e centurie; par A. P. de Borre. From the Author.

The following were by purchase:

Naturgeschichte du Insecten Deutschlands begonnen von Dr. W. F. Erichson. Coleoptera, vol. vi, Nr. 5.

First Supplement to the List of Coleoptera of America North of Mexico, by Samuel Henshaw.

Check List of the North American Macrolepidoptera, 1882.

Check List of the Hemiptera Heteroptera of North America, by P. R. Uhler.

Biologia Centrali-Americana: Coleoptera, vol. ii, pt. 1, pp. 209–232, pl. 18; Part 2, pp. 297–312, pl. 16; vol. iv, pt. 1, pp. 409–424, pl. 18; vol. vi, pt. 1, pp. 41–56. Hymenoptera, vol. ii, pp. 1–24, pl. 1–2.

Curator reported work done during past month.

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The Publication Committee reported in favor of paper 213, entitled: "Descriptions of some new or little known Microgasterinæ" by Clarence M. Weed; also paper 214, entitled: "Notes on some North American Halticinæ (Group Monoplati) by Martin Jacoby, London, Eng. (with supplementary notes by Geo. H. Horn, M. D.); also paper 215, entitled: "Notes on some types of Cerambycidæ in the British Museum" by C. J. Gahan, with explanatory notes by Geo. H. Horn, M. D.; also paper 216, entitled: "Revision of the North American species of Cardiophorus" by Frederick Blanchard. Report accepted and publication ordered.

Papers 217, 218 and 219 were read by title and referred to Publication Committee.

Dr. Horn stated that his attention had been lately directed to the Halticinæ, and stated that it was his intention to review them in order that some uniform nomenclature might prevail. At present no two collections are similarly named, and in none of them is there even a reasonable approach to correctness.

It was important to note the food plants of these insects as they were all more or less injurious. The great extent of color variation was stated. The secondary sexual characters afford, in many cases, the means of separating closely allied species. These were represented on the board.

Mr. Aaron asked for information regarding the stations established under the "Hatch Bill," and it was stated that these were, for the most part, connected with the Agricultural Colleges, which had been established in many States.

Mr. Aaron spoke of the color variation in the wings of some Hesperidæ, and the question was discussed as to how far these had a specific value.

Mr. Aaron moved that a committee of three be appointed to prepare nominations for the election in December, and Messrs. Aaron, Blake and Skinner were appointed.

The next meeting, it was announced, would be held December 10th, after that of the American Entomological Society. Adjourned 9.50.

DECEMBER 10, 1888.

Mr. J FRANK KNIGHT in the chair.

Mr. E. T. Cresson presented his report as Treasurer and was referred to Finance Committee for audit.

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The Recorder made a brief report of the doings of past year.

The committee appointed to prepare a list to be voted upon presented their report, which was accepted and postponed until election should be reached.

Mr. Cresson presented a bill for the steam radiators recently placed in the room greatly to our comfort. The bill of $47.29 was ordered paid.

Mr. Aaron moved the appropriation of $10 for the Academy's janitor for services for the coming year.

Election being in order Mr. Smith moved that the Recorder cast the ballot in accordance with the report of the committee.

The Director *pro. tem.* announced the following election:

Director,—G. H. Horn, M. D.
Vice-Director,—H. C. McCook, D. D.
Recorder,—James H. Ridings.
Treasurer,—E. T. Cresson.
Conservator,—G. B. Cresson.
Publication Committee,—Philip Laurent, H. Skinner, M. D.

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ERRATA.

Page 13, line 13 from bottom, for diappeared *read* disappeared.
" 16, line 19 from top, *read* there is not in that
" 29, add to end of table:
Thorax alutaceous; legs concolorous..... ....**gagatina.**
Page 50, lines 7 and 14, for *Sphingidæ* read *Sphinginæ*.
" 56, line 16, for bungen *read* bringen.
" 56, line 16, for eriste *read* erste.
" 72, line 29, for Allopus *read* Ællopos.
" 77, line 28, for *Phærocampa* read *Chærocampa*.
" 81, line 35, for four *read* fore.
" 85, line 36, for SPHINGIDÆ *read* SPHINGINÆ.
" 153, line 21, for P. *read* A.
" 164, line 34, dele ; after oblique.
" 172, line 20, for rule *read* law.
" 175, line 23, for gemminate *read* geminate.
" 175, line 40, for primaries *read* secondaries.
" 192, line 17, for gemminate *read* gemiuate.
" 196, line 33, after white *insert* spots.
" 219, line 27, after *ophthalmicus* insert five.
" 220, line 9, for corneous *read* carneous.

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TRANSACTIONS

OF THE

AMERICAN ENTOMOLOGICAL SOCIETY.

VOLUME XV.

Review of the species of PLEOCOMA, with a discussion of its systematic position in the Scarabæidæ.

BY GEORGE H. HORN, M.D.

The recent publication of a translation of Dr. Gerstaecker's elaborate discussion of Pleocoma, in the "Entomologica Americana," brings the matter now very fairly and prominently before those who are unable to read it in the original.

It has been my desire to reply to the article, which diametrically opposes the views of Dr. LeConte, and to which I am made a co-respondent, willingly, I admit, by virtue of my association in the second edition of the "Classification."

At the present time there are three undescribed species in my cabinet, these give the opportunity for a review and comparison of all those now known. The females of three species have been studied, two were known to LeConte, one of which lacked the important antennæ. Two of the females belong to the four-lamellate males and one to the seven lamellate.

The larva described by Baron Osten-Sacken as that of Pleocoma has been placed beyond controversy as the true larva by the arguments of Dr. Gerstaecker in the contrary direction.

We have, therefore, the history of Pleocoma far more complete than of many genera of which the species are more numerous and individuals more abundant.

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Through the liberality of friends, whose kindness will be acknowledged in their proper places, sufficient material has been obtained to permit of all necessary dissection, so that the details of Pleocoma will be more thoroughly given than heretofore. At the same time drawings have been prepared to illustrate the parts and to enforce the argument which will follow.

In the following pages I propose to begin with the generic details and to continue with sufficient descriptions of the species, after which the "Literature" will review Pleocoma from its beginning to the criticism by Dr. Gerstaecker in the "Stettin Zeitung" for 1883.

PLEOCOMA Lec.

FORM broadly oval and convex, dorsum slightly depressed, body beneath and legs clothed with moderately long reddish-yellow hair, in one species black, upper surface without hair, the margins fimbriate. Under wings well developed.

HEAD relatively small, rather deeply inserted, eyes large, globular and prominent; vertex with a short erect horn obtuse or slightly emarginate at tip; genæ prolonged each side partly dividing the eye and forming a more or less acute free angle.

CLYPEUS reflexed, forming a rather broad horn more or less emarginate and broader at apex.

ANTENNÆ eleven-jointed, the first joint stout and conical, second globular, but as thick; club long in the male, composed of a variable number of lamellæ from four to seven, the first lamellar joint always glabrous, the others opaque, with sensitive surface.

LABRUM broadly oval, placed either perpendicularly to the axis of the body or slightly obliquely, connate with the clypeus, but with the suture well marked.

MANDIBLES visible only by dissection, placed close together against the roof of the mouth, doubtless immovable, when viewed laterally, of triangular form, the base resting against the roof of mouth, the perpendicular against the inner side of clypeus, outer side ciliate with long hairs.

MAXILLÆ small, the inner lobe in the form of a plate surrounding the outer lobe, the latter a little longer, terminated by an obtusely conical process; surface ciliate within by moderately long hairs.

MAXILLARY PALPI relatively long; first joint short; second longest; third half as long, conical; fourth fusiform, nearly as long as the first.

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MENTUM oval, longer than wide, apex arcuate, base emarginate, supported by a broad peduncle of the submentum, the free face roughly punctured, with long hairs.

LIGULA free, arising behind the apex of the mentum, corneous, form short and transverse, slightly emarginate.

LABIAL PALPI as long or even longer than the mentum and ligula, arising from the apex of the ligula, three-jointed, the last joint as long as the two preceding and more slender.

PROTHORAX transverse, the sides broadly arcuate.

SCUTELLUM transversely oval.

ELYTRA longer than wide conjointly, the apices obtuse; disc with a sutural costa, three oblique discal costæ, limited usually faintly, by geminate striæ, a feeble submarginal costa.

ANTERIOR COXÆ large, conical and prominent, with a large trochantin.

MIDDLE COXÆ large, very narrowly separated.

POSTERIOR COXÆ transverse as usual, rather short, contiguous at middle, but not prominent.

METASTERNAL episterna narrow, the epimeron distinct.

ABDOMEN with six segments, all freely movable, the first concealed by the coxæ and broadly membranous at middle, segments nearly equal in length. By dissection an anal segment is observed, which is always closely retracted. Dorsal portion of abdomen consists of eight semi-membranous segments.

ABDOMINAL SPIRACLES, seven on each side, are situated in the connecting membrane which unites the dorsal and ventral plates.

ANTERIOR TIBIÆ with three large teeth occupying the apical half of the outer edge; four or five smaller teeth above.

MIDDLE TIBIÆ broader at apex, the apical margin undulated or subdigitate, a strong transverse carina at middle of outer edge.

POSTERIOR TIBIÆ similar in form, the apex, however, less undulated.

TARSI slender, as long as the tibiæ, the first four joints slightly decreasing in length, last joint as long as the three preceding. Onychium distinct, trisetose at apex.

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CLAWS slender and moderately long.

TIBIAL SPURS moderately long, middle and posterior tibiæ each with two.

The preceding description is applicable more especially to the male.

The females are shorter, more robust and convex; body without wings. The cephalic processes are less developed than in the male, the clypeal horn scarcely emarginate. The eyes are smaller than in the male and quite flat. The legs are shorter and more robust, although otherwise similar to the male. The tarsi are scarcely half as long as the tibiæ.

As a whole the mouth parts of Pleocoma are small and feebly developed, and so enclosed as to be, apparently, of no use to the insect in taking food. It is probable that during their short life in the imago state very little or no food is taken.

The antennæ vary in their construction according to the species. The club is not placed at a right angle to the stem, but forms quite an acute angle with it. The lamellæ are not of the same form, the lower edge being more or less irregular or undulating. Nor are the lamellæ directly superimposed, as they overlap each other in such a manner as to be misleading without considerable care. The accompanying sketches of the antennæ are to a certain extent diagrams representing all the lamellæ of their proper length brought into vision at the same time. The middle joint of the club is always longer, from this inward and outward the joints are slightly shorter. The first joint of the club is more or less glabrous, at most the edges only have the sensitive surface, the proximal side is fimbriate with moderately long hairs, while the edges of all the lamellæ have shorter and stiffer bristles.

The following species are now known:

Third joint of antennæ shorter and narrower than the first, the club with but four long lamellæ.

Seventh joint of antennæ merely transverse, not prolonged in a process; hairs of underside of body black ..... **Rickseckeri.**

Seventh joint prolonged in a process one-third as long as the following joint; hairs of underside yellow ..... **fimbriata.**

Seventh joint prolonged in a process two-thirds as long as the eighth: hairs yellow ..... **Behrensii.**

Third joint of antennæ nearly as long and as stout as the first joint.

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Thorax convex in front, with at most a slight depression.
Punctures of thorax rather fine, not greatly coarser in front, surface not hairy ..... **conjungens.**
Punctures of thorax relatively coarse, very conspicuously coarser, denser and deeper in front, the surface with semi-erect hairs..... **hirticollis.**
Thorax retuse in front, i.e. suddenly declivous in front and broadly impressed behind a transverse elevation, surface rather finely punctured, not hairy.
Hind angles of thorax distinct, but obtuse; fourth joint of antennæ very little prolonged; sutural and geminate striæ of elytra deeply impressed ..... **Ulkei.**
Hind angles of thorax broadly rounded; fourth joint of antennæ prolonged in a process fully half as long as the following joint; striæ deeply impressed..... **Staff.**

From data given principally by Mr. L. E. Rickseckeri, Pleocoma appears after the first soaking rain usually in October, sometimes November. The males are in far greater number than the other sex, flying in search of the females, whose habit is to remain concealed in burrows or holes in the soil, rarely appearing above ground.

The four species known to Dr. LeConte have been so well described that I do not propose to deal with them in any detail, merely giving such characters as may seem to require fuller explanation.

P. Rickseckeri n. sp.—Oval, one-third longer than wide, black, shining, margins fimbriate and underside clothed with long black hair. Front coarsely and closely punctured, horn of vertex broader and emarginate at apex. Thorax more than twice as wide as long, narrowed in front, widest at base, sides arcuate, the hind angles distinct, but obtuse; disc convex, a slight flattening behind the head, punctures small, not closely placed, sparser near the sides. Elytra a little broader behind the middle, dorsum slightly depressed, sutural striæ deep, the four pairs of geminate striæ on each elytron faintly indicated not punctured, the intervals wrinkled. Body beneath rather densely clothed with long black hair concealing the sculpture. Legs black. Length .80 inch; 20 mm.

Male.—Antennæ piceous, club pale brown; first joint elongate conical, second globular, as wide as first; third narrower, half as long as the first; fourth and fifth together as long as third; sixth short, transverse; seventh shorter and twice as wide as sixth, joints eight to eleven forming an elongate club; ninth joint longest.

1

Female.—Form more robust, ovate, broader behind, more convex, brownish, shining, fimbriate and clothed beneath with moderately long reddish-brown hair. Clypeal horn short, not emarginate, the vertical horn short and broad, emarginate at apex. Thorax less transverse than in the male, more coarsely and closely punctured. Elytra broadest at apical third, the sutural stria moderately deep, the geminate striæ feeble.

2

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Legs much shorter than in the male, the femora more robust. Tarsi short, the posterior pair very little more than a third the length of the tibia. Antennæ much shorter than in the male, terminated by a four-jointed club, the lamellæ short and thick.

The oral organs of the female, as far as can be seen without dissection, are similar to those of the male, except that the palpi are shorter.

This species most closely resembles *Behrensii*, but differs in the structure of the male antennæ, the color of the hair of the underside, the finer punctuation of the thorax and its true black color.

In dedicating this species to Mr. L. E. Ricksecker, it gives me pleasure to acknowledge his great kindness at all times in aiding my studies. To him I am indebted for both sexes of the present species captured by him near Sylvania, California, Nov. 28, 1887.

P. fimbriata Lec.—Broadly oval, slightly depressed, piceous, shining, margins fimbriate and underside densely clothed with yellowish-brown hair. Thorax more than twice as wide as long, broadest slightly in front of middle, hind angles obtusely rounded. Elytra scarcely broader behind the humeri, sutural stria not deep, the interval very little, if any, broader at apex, the geminate striæ very faintly impressed. Length 1.00–1.10 inch; 25–26.5 mm.

Male.—Antennæ as in *Ricksecker*i from joints one to six, seventh prolonged nearly half the length of the eighth, last four joints forming an elongate club as in that species.

5

At the time Dr. LeConte published his notes on Pleocoma (Trans. Am. Ent. Soc. 1874, p. 82) no good specimens were known of this insect. I have recently obtained two fine examples through the kindness of W. G. W. Harford, of California.

Collected in El Dorado County; also in Fresno County, Cal.

It is highly probable that the mouth parts described briefly by Dr. LeConte (Proc. Acad. 1859, p. 71) and attributed to this species may belong to some other. This has no great importance, except as to the distribution of the species.

P. Behrensii Lec.—Oblong oval, sides nearly parallel, piceous, feebly shining, underside and legs castaneous, the margin and body beneath with moderately long, reddish-yellow hairs. Vertical horn scarcely emarginate. Thorax more than twice as wide as long, widest at middle, slightly narrower at base, hind angles rounded, disc in front faintly impressed, a slight impression of the median line at base, surface with moderate punctures not dense, except in the anterior depression, where they are denser and coarser, each side of middle and equidistant, from median line and base a small round fovea. Sutural stria of elytra moderately impressed, the interval very little wider at apex, the geminate striæ distinct, but not deep. Length .85 inch; 21 mm.

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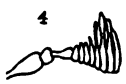
Male.—Antennæ very nearly as in *Rickseckeri* from joint one to five, sixth a little more transverse, seventh nearly three-fourths as long as the eighth, joints eight to eleven as in that species.

3

Captured by Mr. James Behrens near Sauzalito, Marin County; also near Berkeley, Cal., by J. J. Rivers.

The small fovea on each side of the thorax mentioned in the above description is probably not a constant character. A counterpart of it exists in every other species, but is not constant. In *fimbriata* and *Behrensii* there is a well marked, short, oblique depression; in *hirticollis* a vague concavity, while in the other species all trace of it seems to be obliterated by the broad transverse depression.

The female of this species resembles that of *Rickseckeri*, but is a little larger and rather more robust. The antennæ differ from each other in much the same manner that those of the males differ. In the present species the club is truly four-lamellate, the seventh joint more than half as long as the eighth, while in *Rickseckeri* the eighth joint is not longer than the seventh of *Behrensii*; joints four to seven are more transverse than in *Rickseckeri*.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The original from which LeConte described the female passed again to Mr. Behrens, the one now before me belonging to the LeConte cabinet, was collected at Berkeley, Cal., by Mr. J. J. Rivers in the month of May, "nearly dead and too feeble to make a burrow."

P. conjungens n. sp.—Form rather broadly oval, convex, dorsum slightly flattened, piceous and shining above, beneath brown, fimbriate at sides and clothed beneath with reddish-yellow hairs. Clypeal horn deeply triangularly notched, narrowed at base, a slight emargination between it and the lateral processes, vertical horn emarginate at tip. Thorax more than twice as wide as long, very similar in form to *hirticollis*, the sides behind the middle nearly straight and divergent, hind angles very distinct, but obtuse, disc not concave in front, surface sparsely finely punctate as in *fimbriata*, the punctures a little coarser at middle in front, surface entirely without hairs. Elytra a little broader behind the humeri, sutural stria moderately deep, the interval a little broader behind, the geminate striæ indicated by rows of punctures, the interspace sparsely punctate, not wrinkled. Legs piceous. Length .92 inch; 23.5 mm.

Male.—The antennæ do not seem to differ appreciably from those of *hirticollis*.

At first glance this species would be mistaken for *fimbriata*, but the structure of the antennæ approaches it to *hirticollis*, from which it differs by the absence of hairs from the thorax as well as by the style of punctuation.

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Three ♂ specimens have been seen, one of them kindly given me by Mr. J. J. Rivers, of Berkeley, Cal. Two of them have the fourth antennal joint prolonged in a process, one as figured for *hirticollis*, a second shorter, a third without any process. The latter is smaller than the others and probably is merely a feebly developed specimen, although antennal differences are usually specific. All were taken in the same flight.

Occurs near Santa Cruz City, California.

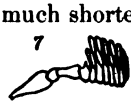
P. hirticollis Schaufuss.—Oval, slightly oblong, not broader behind, piceous and shining above, castaneous beneath, fimbriate and clothed beneath with yellowish hair. Clypeal horn with rather strongly divergent sides, a distinct notch separating it at base from the lateral processes. Thorax more than twice as wide as long, sides more abruptly narrowed from the middle to apex, broadest at base, hind angles distinct, but obtuse; disc somewhat declivous in front and broadly flattened, the surface more coarsely and closely punctured than in the other species, the punctures in the depression very coarse, deep and close, with semi-erect hairs sparsely scattered over the thorax, more numerous in front. Elytra with feebly arcuate sides, sutural stria deep, the interval distinctly broader behind, the geminate striæ very faint, the surface sparsely punctate, comparatively smooth. Length .80 inch; 20 mm.

Male.—First two joints of antennæ very like *fimbriata*, third nearly as large as the first; fourth short, with a slender process one-half as long as the lamella of the fifth; joints five to eleven forming a long club, the lamellæ gradually larger to the eighth, then gradually shorter.

6

Female.—Ovate, robust, convex, reddish-brown. Clypeal horn short, broad and feebly emarginate, vertical horn short, rather deeply emarginate. Thorax similar in outline to the male, but not more than twice as wide as long, not impressed in front, moderately strongly and closely punctate, nearly equally over the entire surface, median line smooth, without erect hairs. Elytra broadest behind the middle, sutural stria not deeply impressed, the interval not wider behind, geminate striæ very faintly indicated, surface more sparsely punctate than the thorax. Legs very robust. Length 1.32 inch; 33 mm.

The antennæ of the female are of the same type as the male, but much shorter and with the lamellæ short. First joint conical, second globular as well as first, third more slender, half as long as first, fourth short, transverse, angulate on inner side, fifth prolonged in a lamella, three-fourths as long as sixth, joints six to ten nearly equal in length, the eleventh shorter.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When the leaves of the lamellæ are closed the apices are contiguous, but the joints at middle are separated.

The description of the female is taken from a perfect specimen in the LeConte cabinet, the one originally described has been in my possession since he received the other.

The male specimens have brownish or yellowish-brown elytra, they may possibly be somewhat immature, although I suspect they are never so dark in color as *fimbriata* and *Behrensii.*

For the specimens in my cabinet I am indebted to Mr. Henry Edwards, who collected them Nov. 3, 1866, near Nevada City, Cal., drowned in a small stream of water.

P. Ulkei n. sp.—Oblong-oval, convex, dorsum depressed, surface shining, margin fimbriate and body clothed with reddish-yellow hair. Head piceous, clypeal deeply oval emarginate, ante-ocular processes auriculate (not triangular and acute). Thorax piceous, a paler space at the sides, more than twice as wide at middle, as long, widest at middle, very strongly arcuately narrowed in front, slightly narrowed to the basal angles, which are distinct, but rounded, disc retuse (rather abruptly declivous) in front, a transverse obtuse elevation at middle, behind which the disc is slightly concave, surface sparsely finely punctate, a little more coarsely toward the sides. Elytra pale castaneous, sutural stria deep, the interval convex and wider behind, geminate striæ deeply impressed and punctured, the intervals sparsely punctate, not rugose. Legs castaneous. Length .96 inch; 24 mm.

Male.—First three joints of antennæ as in *hirticollis,* fourth joint short, with a slight prolongation, joints four to eleven forming an elongate club as in *hirticollis.*

Of this species I have seen but one specimen. It is, therefore, not possible to say whether the paler elytra are due to immaturity or represent the full color.

It gives me pleasure to dedicate this splendid species to my friend, Henry Ulke, of Washington, whose name has often been mentioned in our writings as a synonym for kindness and liberality.

Collected in Utah. Remarkable as the first species known outside of the California fauna.

P. Staff Schaufuss.—Oval, slightly oblong, convex, dorsum scarcely depressed, head and thorax piceous, elytra pale chestnut-brown, beneath and legs brownish, the margin fimbriate and clothed beneath with pale brown hair. Clypeal horn deeply emarginate, very little narrower at base, vertical horn short, conical; ante-ocular processes auriculate. Thorax more than twice as wide as

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long, much narrowed in front, sides broadly arcuate, hind angles very broadly rounded, disc retuse in front and broadly concave behind an obtuse transverse ridge at middle, surface finely not closely punctured, punctures coarser toward the sides. Elytra very little broader behind the middle, sutural stria deep, interval a little broader at apex, geminate striæ deep and coarsely punctured, the interspaces sparsely punctate with intermixed punctures. Length 1.05 inch; 26.5 mm.

Male.—The first five joints alone remain on the specimen examined; these are almost an exact repetition of those of *hirticollis.*

This species and *Ulkei* have a close superficial resemblance in form, color and sculpture. In the present species the hind angles of the thorax are so broadly rounded that the sides and base are really continuous. The fourth joint of the antennæ is merely transverse in *Ulkei,* while in *Staff* it is prolonged in a process half the length of the fifth joint.

As remarked by Dr. LeConte, this species is recognizably described by Mr. Schaufuss; at the same time the name given was dropped and *Edwardsii* substituted. While I fully agree with LeConte in all he says about keeping our literature and "scientific nomenclature free from all personal, political or religious prejudices or expressions of opinion," I cannot accept an arbitrary change of the name as an adequate amendment of an unwise obtrusion of a scientific name given under those influences. Prejudices are, for the most part, very ephemeral, but an ill-conceived scientific name remains as a monument to the folly of the individual who gave it.

California. The precise locality unknown.

———o———

For an account of the habits of Pleocoma we are probably more indebted to the publications and letters of Mr. L. E. Ricksecker than to any other observer. The following summary has been prepared mostly from private letters from him and others.

The first rains of the wet season in California fall at variable times in October and November. After the first fall of sufficient extent to moisten the soil for a depth of six inches or more the specimens emerge and the males are found flying about, usually in considerable numbers in their search for the females.

Mr. Ricksecker writes, "no females have yet been found really *on* the surface of the ground, and it is at present a matter of doubt

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whether they actually emerge and walk away to some distance to re-enter the earth or whether they only approach the surface and open a way for the males to find them. The female sent you was found four inches underground, going downwards, with three males following her."

Mr. Rivers found one female on the surface nearly dead and too feeble to make a burrow.

While nearly all the individuals of a brood emerge at the same time it seems that some are retarded, so that of two females of *Rickseckeri*, of which I have data, one emerged with the vast majority of the brood Oct. 16, 1886, a second "after a warm rain Dec. 7, 1886, being either a straggler from a deeper burrow, or more probably one that had not been previously found by any male and had approached the surface a second time. A male was near by where the female was found just under the surface."

After the flight all the specimens disappear, the males dying, or are captured by insectivorous birds and mammals, the females entering the burrows to deposit their eggs.

PLEOCOMA Lec.

Proc. Acad. Nat. Sci. 1856, p. 24.

P. Rickseckeri n. sp.

P. fimbriata Lec., Proc. Acad. 1856, p. 24; Pacific R. R. Rep. ix, App. 1, p. 40, pl. 1, fig. 13;* Proc. Acad. 1859, p. 71 (describes mouth parts); Trans. Am. Ent. Soc. 1874, vol. v, p. 82.

P. Behrensii Lec., Trans. Am. Ent. Soc. 1874, vol. v, p. 83.

P. conjungens n. sp.

P. hirticollis Schaufuss, Nunquam Otiosus, Dresden, 1870, vol. ii, p. 51; Lec., Trans. Am. Ent. Soc. v, p. 83; Lec., Pacific R. R. Rep. loc. cit. p. 40, note †

P. Ulkei n. sp.

P. Staff Schaufuss, Nunquam Otiosus, ii, p. 50.
adjuvans Crotch, Check List, 1874.
Edwardsii Lec., Trans. Am. Ent. Soc. 1874, p. 83.

* The outline figure is fair, the antenna is not accurate, and in addition does not belong to *fimbriata*.

† The note was evidently hurriedly written, for reasons given, and the specimens supposed to belong to *fimbriata* are *hirticollis*.

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Literature of Pleocoma.

Proceedings Acad. Nat. Sci. Phila., 1856, p. 24.

In this article Dr. LeConte established the genus and described *P. fimbriata.*

The original specimen (Pl. 1, fig. 1) was badly mutilated, having been partially eaten by a bird. The oral organs were destroyed, the abdomen entirely gone; one antenna and part of the legs remained.

In this article, at the beginning of a paragraph, LeConte says of Pleocoma, "apparently belonging to the Dynastidæ," and after some speculations concerning resemblances to Syrichthus and Athyreus (our species are now Bradycinetus) concludes the paragraph as follows: "Doubt must, therefore, be entertained whether the genus should be placed with the Dynastidæ or Geotrupidæ."

Considering the material at his disposal I think the article is an evidence of his wonderful analytical powers.

Pacific R. R. Reports, 47th parallel, vol. ix, App. i, p. 40, pl. I, fig. 3.

In this article LeConte again says, "as the oral organs and the abdomen are destroyed I cannot tell whether this genus belongs to the Dynastides or Geotrupides; in either case the four-jointed antennal club is equally remarkable. The affinities, so far as I can understand them, seem to be rather with Geotrupes."

In a foot note, written on the eve of a journey, the author speaks of the arrival of a perfect specimen closely resembling *fimbriata*, differing in having a seven-jointed antennal club. This he suspected might be a sexual difference. The foot note contains this expression, "Although agreeing with Geotrupidæ in the eleven-jointed antennæ, the form of the antennæ is entirely anomalous in that and allied groups, and the small size of the oral organs would seem to indicate a new group between Geotrupidæ and Copridæ."

The specimen referred to in the foot note belongs to *P. hirticollis*, and it seems to me unfair that Gerstaecker says that LeConte changed his diagnosis of the genus when the remark, by LeConte's statement, applies to the insect just at that moment received.

Proceedings Acad. Nat. Sci. Phila., 1859, p. 71.

In this article LeConte briefly describes the oral organs obtained in a fragmentary condition from the stomach of a woodpecker, and concludes with these words: "It will be seen that combined with the eleven-jointed antennæ with polyphyllous club, the characters

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above detailed are abundantly sufficient to establish this genus as a new group, related to the Geotrupidæ and Copridæ, with, however, a strong tendency toward the Dynastide group of Scarabæidæ pleurosticti."

Classification of the Coleoptera of North America, 1861, p. 128.

Here the tribe Pleocomini is defined and placed after the Geotrupini.

Nunquam Otiosus, vol. ii, 1870.

Dr. L. W. Schaufuss describes two new species of Pleocoma.

Trans. Am. Ent. Soc. v, 1874, pp. 81-84.

Dr. LeConte gives a table of the species known to him, describes one new, renames one of those described by Schaufuss and describes the females of two of the species. Sketches of the antennæ are given not very accurately drawn.

Following this paper is a description of the larva of Pleocoma by Baron R. Osten-Sacken.

Classification of the Coleoptera of North America, 1883, p. 244.

This work is a revised edition of that mentioned above, in which it was my privilege to be associated with Dr. LeConte in authorship. The genus Pleocoma occupies the same position as in the former work.

In reviewing the work of Dr. LeConte there will be seen a very consistent evolution of opinion based on more and better material, but from the first he has insisted on the evident relationship of Pleocoma with the Geotrupini. As early as 1861 all reference to any Dynastide affinity diappeared from his writings, having continued from 1856 to 1859, in what was the period of extremely poor and limited material for study.

Without wishing to anticipate I may here state that the opinion published by us in the "Classification" of 1883 was not adopted without a careful study of the comparatively abundant material then before us.

Stettiner Entomologische Zeitung, 1883, pp. 436-450.

Dr. Gerstaecker publishes, under the title, "On the position of the genus *Pleocoma* Lec. in the Lamellicorn system" a lengthy article, full of interesting information, in which he deduces results calculated to destroy our faith in the analytical power of Dr. LeConte, but—the deductions are not warranted by the actual facts of the case.

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We owe to John B. Smith, of the National Museum, a carefully prepared translation, so that those unacquainted with the language of the original may read the views of Gerstaecker in "Entomologica Americana" vol. iii, pp. 202–211.

I propose to pass the paper of Gerstaecker in review as briefly as consistent with accuracy, while the reader will have in the preceding pages and the plate, the material on which my arguments are founded. Gerstaecker begins with the statement of the well known fact that the larger divisions, called families among insects, divided more or less naturally and sharply into subordinate groups, but that genera often occur with such varied relationships that it is difficult to place them, as different authors will give greater regard to characters subordinated by others.

After stating what material he has studied, he says he has examined the superficial characters and those not immediately visible, and hesitates no longer in asserting that *Pleocoma* belongs to a group remote from Geotrupini.

Then follows a resumé of LeConte's writings, as has been given in the preceding pages, quoting more liberally than I have done. He seems not to have seen the second edition of the "Classification."

Dr. Gerstaecker correctly surmises that *Pleocoma* cost LeConte considerable thought, but the changes of opinion are merely the dropping off of supposed affinities, first "Dynastiform" disappears, then "Coprini," but the Geotrupide idea is permanently retained. The first perfect specimen LeConte saw fixed the idea that its affinities were with Geotrupes.

Then Gerstaecker proceeds to picture the train of thought which caused LeConte to arrive at his final conclusion, but the thought does not seem to have arisen in Gerstaecker's mind that probably LeConte examined the spiracles. That LeConte did examine the spiracles I can assert positively, and the specimens used were those mentioned in the foot note in the paper in the Pacific R. R. Reports.

"But what, actually, is the structure of the abdomen?" asks Gerstaecker. "This examination proved, positively what I fully expected,—that the large spiracles of the second and third, and the smaller ones belonging to the fourth and fifth abdominal segments had, in *Pleocoma, precisely the same situation as in Melolontha*, that is on the superior portion of the ventral segments, and not on the membrane connecting the corneous, dorsal and ventral plates, as in Geotrupes."

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At this point I wish to assert positively that the abdominal spiracles, seven in number, *are all situated in the connecting membrane*, the last spiracle is concealed by the closing together of the last dorsal and the last visible ventral segments. Consequently Pleocoma *is a Laparostict Lamellicorn!*

In order that the position of the spiracles may be seen by those who do not have a Pleocoma, much less a specimen to dissect, I have had the accompanying photographic block prepared from a dissection spread between glass plates. The photographic method has reversed the sides, this being the same preparation as that sketched on Plate II. The ventral portion is to the left. The small terminal segment is not visible, except by dissection, being completely retracted within the abdomen. The accompanying figure is about two and a half times the size of nature.

The argument drawn from the oral organs by Gerstaecker seems to me of but little value. Pleocoma, as already stated, has but a brief existence, the mouth parts are reduced in size and so crowded as to be of little use in taking food. As far as the mouth parts are concerned Pleocoma differs no more from Bradycinetus (*Athyreus* ‡ olim) than the latter does from Aphodius (pl. ii, figs. 6–16), and I think there can be no doubt that these are equally Laparostict Lamellicorns. Atrophy of the mouth parts is observed in more than one family of Coleoptera and indicates, usually, a very ephemeral life in the species.

After having stated several times that Pleocoma is *not* a Laparostict, Gerstaecker discusses the question whether it should constitute a distinct tribe. It is not necessary to follow his argument here unless it be conceded that the position of the spiracles is Pleurostict, then he may be right, otherwise wrong.

Gerstaecker then discusses the structure of the antennæ. It must be admitted that these are entirely anomalous for a Laparostict and suggest the polyphyllous clubs of many of the Melolonthidæ well known to every one. This is, however, one of those instances abundant everywhere in zoology in which an animal, with a fundamental structure of some well recognized series, has a superadded peculiarity possessed by some other group not otherwise related.

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In a resumé Gerstaecker again refers to the oral organs and states that the figures given by Erichson (Entomographien, pl. 1, figs. a–e, g–i) of the mouth parts of Elaphocera and Pachypus might be referred to *Pleocoma*. I can see no such resemblance as any one can realize by comparing the figures quoted with those prepared by myself of *Pleocoma*.

"After having, in the preceding remarks, disproved all the arguments brought forward by LeConte to justify his placing *Pleocoma* near *Geotrupes* by proving its Melolonthid character—in the imago—," Dr. Gerstaecker proceeds to discuss the larva described by Baron Osten-Sacken as that of *Pleocoma*.

I will admit that I had grave doubts of the accuracy of the determination of that larva until I had read the remarks of Gerstaecker denying that it could possibly be the larva of *Pleocoma*. His opposition and all he says convince me that inasmuch as *Pleocoma is* a *Laparostict*, and that the larva "made known by Osten-Sacken belongs to the Scarabæidæ Laparosticti, admits, indeed, of no doubt"—all this satisfies me that we have truly the larva of *Pleocoma*, as there is not that well explored part of California from which the larva was obtained any other Laparostict Scarabæide, or Lucanide of any size approaching that required by a larva 50 mm. long, or even of a larva 30 mm. long.

"To compare a 50 mm. long larva with Geotrupini and Trogini is strange to begin with." I can hardly see what size had to do with comparisons based on structure. Objection might be as well made to the comparison of the larvæ of *Rhynchophorus palmarum* and *Calandra oryzæ*, which differ more greatly in size, although nearly identical otherwise.

Certain other statements regarding the plication of the segments in Geotrupini and Lucanidæ are certainly open to very severe criticism, but this is foreign to the object of these remarks. I will only say that Gerstaecker's reference of the larva to Lucanidæ is singularly unfortunate from every point of view.

Having gone as thoroughly over Gerstaecker's remarks as seems necessary, I will give the following as a summary of the results of my study:

1. Pleocoma is an undoubted Laparostict.

2. There are six free ventral segments, the first almost entirely concealed by the coxæ. A small anal segment exists, always retracted, visible only by dissection.

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3. Antennæ eleven-jointed, the club ♂ elongate with 4-7 lamellæ.

4. Pleocoma should form a distinct group, related more closely to the Geotrupini than any other group of Laparosticti.

5. Any relationship with the Melolonthidæ must be deduced (1) from the elongate antennal club (2), the geminate, oblique striæ of the elytra which represent the feeble costæ of the Rhizotrogini (3), the long hair of the underside. The first alone has substantial value.

6. It seems to me of but little moment whether Pleocomini is placed before, after, or alongside of Geotrupini, the fact remains that, inasmuch as *Pleocoma* is a Laparostict, Geotrupini is its nearest ally. It has nothing to do with the Dynastini.

7. The larva described by Osten-Sacken is undoubtedly that of *Pleocoma*. Mr. James Behrens, who obtained the larva, has given me sufficient evidence apart from the structure. As these data will probably be published by Mr. Behrens, I merely state the fact and leave the other evidence to him.

DESCRIPTION OF PLATES.

PLATE I.

This plate has been produced by Mr. F. Gutekunst by means of the Phototype process from photographic negatives taken directly from the specimens. The figures are, therefore, accurate reproductions of the form and appearance of the species.

Fig. 1. *Pleocoma fimbriata** Lec. The original type. The artist seemed pleased to find that many of the defects had been concealed by the arrangement of the light. The figure looks far better than the specimen.

Fig. 2. the same, a perfect specimen.

Fig. 3. *P. conjungens* Horn.

Fig. 4. *P. Behrensii* Lec.

Fig. 5. *P. Behrensii** Lec., a female.

Fig. 6. *P. Ulkei* Horn.

Fig. 7. *P. Rickseckeri* Horn.

Fig. 8. *P. Rickseckeri* Horn, a female.

Fig. 9. *P. Staff** Schaufuss.

Fig. 10. *P. hirticollis* Schaufuss.

Fig. 11. *P. hirticollis** Schauf., a female.

Fig. 12. *P. hirticollis* Schauf., a larger female.

* I am indebted to the kindness of the authorities of the Museum of Comparative Zoology at Cambridge, through Dr. Hagen, for the facilities extended in the preparation of the necessary negatives for the specimens indicated.

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PLATE II.

Fig. 1. Right half of abdomen, showing the position of spiracles in *Pleocoma.*
Fig. 2. Diagram in transverse section showing the relation of spiracle to adjacent parts.
Fig. 3. Anterior and posterior tibiæ of *P. fimbriata.*
Fig. 4. Lateral view of head of *P. hirticollis*, the mouth parts removed.
Fig. 5. Front view of clypeus and labrum.
Fig. 6. Head beneath, showing the relation of parts, the maxillæ are not so plainly visible in nature.
Fig. 7. Mandibles as seen from beneath *in situ.*
Fig. 8. Right mandible as seen from side.
Fig. 9. Right mandible (more enlarged) as seen from the upper side.
Fig. 10. Left maxilla, the side adjacent to mentum.
Fig. 11. same the side adjacent to mandible.
Fig. 12. Right maxilla *a* lower side, *b* upper side of *Bradycinetus ferrugineus.*
Fig. 13. Mentum and ligula of same.
Fig. 14. Mandible of same.
Fig. 15. Maxilla of *Aphodius erraticus* (after Duval).
Fig. 16. Mentum and ligula of same (after Duval).
Fig. 17. Form of maxilla of larva of Pleocoma from a sketch of the cast skin.
Fig. 18. Mentum and ligula of same.

Descriptions of the larvæ of Glyptus, Platypsylla and Polyphylla.

BY GEORGE H. HORN, M.D.

The larvæ of Coleoptera will doubtless yield facts of taxonomic value, and may aid in settling disputed relationships among the imagines. Some attempts have already been made in this direction, notably by Erichson and others among the Scarabæidæ, and more recently by Rey in Elateridæ. Some families have yielded very little, from the fact that the species have almost the same mode of life as Cerambycidæ, Buprestidæ, and the majority of the Rhynchophora.

At present too little attention seems to be paid to study of this sort, and every student of classification should consider it a duty to describe any authentic larva known to him with such figures of form and detail as may be useful hereafter.

Recently three larvæ have come into my possession, two of which are entirely new, the third merely showing the almost absolute identity of our form with that of European species, and in accordance with the idea above explained the following descriptions are given with figures and details on the accompanying plate.

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Glyptus sculptilis Brullé.

During a visit to the Museum of Comparative Zoology at Cambridge in the summer of 1887, Dr. Hagen showed me some larvæ from the west coast of Africa with the following history:

About fifty years ago Dr. Savage, in company with Dr. Perkins, was engaged in missionary work in Sierra Leone. On their return they brought many objects of natural history, among them some insects, which received attention from Dr. T. W. Harris. A specimen of *Glyptus sculptilis* in the lot came finally into the possession of Dr. LeConte, and is now in his cabinet. This insect, it is well known, lives in the nests of the great white ant of that region.

From the nests of that ant Dr. Savage obtained queens, some of very great size, and in the same bottles were smaller objects supposed to be small queens of the same. When the collection reached Cambridge, from Salem, Dr. Hagen at once recognized the fact that these smaller specimens were not queen ants, but larvæ unknown to him.

When these larvæ were shown to me it was at once seen that they were Carabide larvæ. The fact that Glyptus was known to occur with these ants was made known to Dr. Hagen who has searched the literature with great care for any mention of the larva, but fruitlessly. Believing that a larva, which seems so rare, should be made known the following description is given:

Form.—Somewhat clavate, robust, narrow in front, gradually broader to the ninth and tenth segments, then rapidly narrower. Length 1.25 inch or 32 millimetres. Pl. iii, figs. 1–2.

Color.—Whitish, the head pale brown.

Head.—Small, flat above, very convex beneath, pale brown, the gular region broadly paler. Clypeal region prolonged, arcuate, the margin slightly crenate, a few erect hairs at the sides of the front and behind the insertion of the antennæ, a few punctures at sides of the head. Pl. iii, fig. 3.

Ocelli.—Entirely absent.

Antennæ.—Four-jointed, arising from a membranous base behind the base of mandibles and not much prolonged beyond the apex of the latter; first joint stout, with moderately long stiff hairs in front; second narrower, two-thirds as long; third narrower and shorter; fourth small, almost subulate, placed obliquely on the third, terminating in two bristles. Pl. iii, fig. 4.

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MANDIBLES.—Stout, placed nearly vertically, strongly curved, the antero-inferior edge deeply trisulcate, the inner edge obtusely tridentate, the middle tooth longer. Pl. iii, figs. 4 and 6.

MAXILLÆ.—Short and rather stout, the basal piece or support short, semi-corneous; cardinal piece cylindrical, semi-corneous, obliquely truncate at apex and filled with membrane; the outer or palpar lobe four-jointed, the first joint longer than the others together, second and third rapidly shorter, fourth small, subulate. Inner lobe extending nearly as far as the palpar lobe, rather slender, indistinctly divided in two unequal parts. The maxillæ have a few stiff hairs on the cardinal piece. Pl. iii, fig. 5.

MENTUM.—Pentagonal in form, semi-corneous, supported on a semi-membranous extension of the gula, the ligula prolonged in a corneous joint and terminated by two bristles. Pl. iii, fig. 5.

LABIAL PALPI.—Short, two-jointed, the first joint short and stout, the terminal small and conical.

PROTHORAX.—Much broader than long, broader behind, arcuate in front, a narrow, semi-corneous space each side, behind which is a deep groove; surface with erect hairs sparsely placed, directed to the front, and a fine median groove which extends to the end of the eleventh segment.

MESO- and METATHORACIC SEGMENTS.—Similar in form, shorter than the prothorax, each with a transverse crescentic region bearing very short spines with a few longer hairs directed backwards.

ABDOMINAL SEGMENTS.—On the upper side the first six segments have a small space each side of the middle bearing very short spines.

SIDES of BODY.—Distinctly wrinkled, showing the division between the dorsal scutes, the connecting membrane and the ventral plates.

UNDERSIDE.—Flatter than the upper surface, the ventral segments 2–7 with a small mammiliform protrusion on each side bearing very short spines, the last two segments with a transverse ridge bearing longer spines.

LAST SEGMENT.—With a feebly protrusile pseudo-segment.

LEGS.—Rather short, the anterior pair stouter. Femur longer than the rest of the leg, the tibia broader at apex; tarsi bi-articulate, terminated by a single stout claw. Pl. iii, fig. 7.

SPIRACLES.—On each side nine, the first situated in the connecting membrane at the side of the mesothorax close to the anterior border. The other eight spiracles are smaller and are placed in the

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dorsal plates of the first eight ventral segments, close to their junction with the connecting membrane.

From the above description and the accompanying figures it will be seen that the larva is undoubtedly that of a Carabide. It is remarkable that there is, practically, no thoroughly corneous structure in its entire surface, except the head. The absence of ocelli is accounted for by its subterranean life.

While there is possibly room for discussion as to whether this is really the larva of Glyptus there is in my own mind no doubt; first from the collateral evidence already given, and, secondly the mandibles of the larva are a very close reproduction of those of the perfect insect.

The Museum of Comparative Zoology possesses quite a number of these larvæ and Dr. Perkins, who is now living, states that they were dug from the nests as stated in the label, which he identified as in the handwriting of Dr. Savage.

Polyphylla decemlineata Say.

FORM of the usual Scarabæide type,—soft, flat, whitish, the caudal extremity recurved beneath. Pl. iii, fig. 8.

HEAD brownish, broader than long, convex, slightly scabrous. Pl. iii, figs. 9–10.

LABRUM short, crescentic, anterior border arcuate.

MANDIBLES stout, curved, slightly curved downward, the apex chisel shaped, slightly sinuous, with a slight notch internally.

MENTUM short, crescentic, the anterior outline oval, its face hairy, the apex with larger ciliæ, the peduncle of the gula also oval in front. Labial palpi two-jointed, arising in a transverse groove behind the apex of the mentum, the joints equal in length. Pl. iii, figs. 13–14.

MAXILLÆ large, arising on each side of the base of the mentum, the two lobes united, except a slight fissure at apex, the internal lobe with three spiniform teeth at apex, the inner side with stiff spiniform hairs, the outer lobe with spines at apex. Pl. iii, fig. 12.

MAXILLARY PALPI four-jointed, the first joint very short, second longest, third half as long, the fourth two-thirds, the entire palpus projecting but little beyond the maxilla.

ANTENNÆ four-jointed, arising from a tubercle at the front angle of the head behind the base of the mandible. First joint stouter, broader to tip, second longer and more slender, third a little longer

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than half the second, the lower apical angle prolonged in a point beneath the fourth joint, last joint oval, acute, shorter than the third.

THORACIC SEGMENTS short, each with two dorsal plications.

ABDOMINAL SEGMENTS from the first to fifth formed of three plicæ, one of which is narrower on the dorsum and pyriform in outline beneath, the other two cuneiform, broader on the dorsum and gradually more acute beneath. At the ventral end of the larger are somewhat oval folds, in which the stigmata are placed. Last three segments quite smooth, not plicate, the terminal segment divided into two unequal parts by a distinct suture, and near the apex a deep arcuate impression separating a pseudo-pygidium. Anal opening transverse.

LEGS widely separated at base, the posterior pair longer, hairy above and with spinous hairs beneath. Pl. iii, figs. 15–16.

COXÆ long and rather slender, supporting a trochanter, the femur short and stout, the tibiæ oval, the front tibia with a single long claw, the middle with a short claw, the posterior without claw.

STIGMATA on each side nine, the first in the prothoracic segment, the others in the lower side of oval plicæ in the first eight abdominal segments.

SURFACE.—The thoracic segments are comparatively smooth, a few indistinct scattered granules and with moderately long erect hairs. The abdominal segments 1–8 are moderately densely granulate, each granule with a very short erect hair. The last three segments of the abdomen are smooth and shining, a few scattered long hairs. The terminal segment is, however, more punctate and rugulose near the tip, the hairs more numerous. The underside of the body has scattered hairs.

LENGTH measured along the upper side of body from tip of mandibles to anal fissure 2.10 inch ; 53 mm.

This larva does not differ essentially from that of the European *Melolontha vulgaris* as figured by Ratzeburg (Forst. Insecten pl. iii, fiig. 1, et seq.). As in that species the thoracic region is the wider, from this the body is gradually narrower to the fourth abdominal segment, then gradually wider to the last segment.

For the specimen described and figured I am indebted to Mr. J. J. Rivers, of Berkeley, California.

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Platypsylla castoris Rits.

FORM elongaté-oval, equally narrowed at either extremity, about three times as long as wide, depressed. Color whitish. Length 1.6 mm. Pl. iii, figs. 17–18.

HEAD semicircular, more obtuse in front, hind angles distinct, a long seta directed outwardly arising from near the hind angles, beneath with six shorter setæ directed backward arising near the posterior border. Eyes wanting. Pl. iii, fig. 19.

ANTENNÆ four-jointed, arising under the hind angles of the head. First joint short and broad, second narrower, bearing a spiniform process at the front angle; third cylindrical, narrower; fourth very narrow, bearing two setæ at its end. The joints are capable of telescopic retraction. Pl. iii, fig. 20.

MENTUM quadrate, a little longer than wide, supported by a short peduncle of the gula; ligula not distinctly separated, but broader than the mentum, emarginate in front, the angles rounded. Labial palpi short, two-jointed, inserted at the side of mentum at the probable point of separation in the ligula.

MAXILLÆ flattened, pyriform, rapidly narrowing at apical third, terminating in a narrow, obtuse process. Maxillary palpi short, three-jointed, arising at the sides of the maxillæ a little more than one-third from the apex. Pl. iii, fig. 19.

MANDIBLES conical, but slender and flattened, semi-corneous, arising from the sides of the buccal cavity exterior to, but a little in front of the maxillæ, slightly overlapping the apices of the latter, the tips of the mandibles crossing each other in front.

THORACIC SEGMENTS gradually wider, hind angles obtuse, upper side with four long setæ, the two near the hind angles directed outwardly and backward, those each side of middle directed backward, the lateral margin bearing a short spine near the middle. Underside of each thoracic segment with six or eight moderately long setæ arising near the posterior border and directed backwards.

ABDOMINAL SEGMENTS nine. First narrower than either the metathorax or the next, and without the short spine near the side margin. Segments 2–7 similar in form, each with the short lateral spine, eighth without lateral spine, ninth rapidly narrowed, the apex obtuse. Dorsal side of segments bearing four setæ as in the thoracic segments; ventral side with four pairs of long setæ, between which

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are two or three shorter ones arising close to the posterior margin of the segment and directed backwards; across the middle of each segment (except the last) a row of short spines. Anal fissure with a process each side, bisetose at apex.

LEGS short and stout, widely separated, the coxa oval, femur more or less quadrate in outline, tibia more cylindrical, terminated by a single strong claw. Anterior femur obtusely subangulate beneath. The edges of the articulations with spinules gradually shorter to the tip of tibia. Pl. iii, figs. 21–22.

SPIRACLES.—There are nine pairs of spiracles. The first pair is situated at the side of the mesosternal segment close to the anterior angle in a fold between the dorsal and ventral plates. The abdominal spiracles are in the first eight segments on the dorsal side just within the position of the short lateral spine. The last spiracle is, however, nearer the angle than the others.

The larva just described is, in form, like that of a slender Silphide, recalling also the Corylophidæ, but too little is yet known of the larvæ of many genera to which Platypsylla is supposed to be related to enter into any generalizations.

It is well known that no mandibles have been detected in dissections that have been made of the imago, but in the larva we have very distinct mandibles which are probably lost in the last moult of the larva to the pupa state. By comparison it will be seen that the buccal cavity is similar in outline in the larva and imago.

The maxillæ are soft in structure and give no evidence of the future form of those of the imago.

The largest of the larvæ seen is not longer than 1.6 mm. and is probably not fully grown, seeming rather disproportionate in size to the future imago. It must not be supposed that a small larva presupposes a small imago, as the larva of *Dicælus purpuratus* would never be suspected of yielding the large imago without actually raising the larva to maturity.

For great assistance in the determination of the position of the spiracles I must acknowledge my indebtedness to Prof. C. V. Riley, who has also, for some time, had this larva under consideration. By means of stained specimens and photography the entire structure has been very accurately developed.

The larvæ in Prof. Riley's hands vary in size (like my own) from 1.2 to 1.7 mm. and were obtained from a Beaver trapped by Mr. Lawrence Bruner at West Point, Neb., October, 1886.

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The larvæ before me were obtained from Beavers trapped in some of the tributaries of the Colorado of Texas. The tender skin behind the ears seems to be the favorite place, the larvæ being concealed under scales of dried material, seemingly mucilaginous.

I owe these larvæ to the kindness of a friend who has recently traveled in Texas, through whose instruction the skins were so prepared that he was enabled to obtain what, at one time, seemed almost a hopeless desire.

The eggs of Platypsylla were also observed. They are minute objects, not fastened to the hair, as is the case with lice, but placed directly on the skin among the densest hair.

When the larva are removed from the fur and placed on a flat surface they move with the sinuous snake-like motion observed in Staphylinide larvæ.

The fully developed beetles have also a mode of progression decidedly Staphylinide in appearance.

Platypsylla seems destined to have difficulty in finding a final resting place.

Ritsema, in the beginning, referred it to the Aphaniptera, an indefinite aggregation of forms gradually disentegrating.

Shortly after Prof. Westwood made it the type of a totally distinct order *Achreioptera.*

During his sojourn in Europe Dr. LeConte obtained specimens, and after the study of dissections, carefully made by Rev. A. Matthews, claimed Platypsylla as a Coleopter of the Clavicorn series and placed it in relation with Silphidæ and Leptinidæ.

My own dissections and study have not caused me to doubt in any respect the opinion of Dr. LeConte.

In the "Berlin. Zeitschr." xxx, 1886, p. 103, Kolbe, in a short paper, sees resemblances between the mouth parts of Platypsylla and certain Mallophaga (bird lice), and is dispos d to unite it with the latter series.

Dr. A. S. Packard, in a review of the Mallophaga, considers them degraded members of the pseudo-neuropterous series.

If we combine the opinions of the last two authors we will have another position for Platypsylla in the Neuroptera (in the broad sense), an order which seems destined to be the asylum for entomological invalids of all sorts.

Platypsylla seems widely distributed. First discovered on the American Beavers in the Zoological Gardens at Amsterdam. I have

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received it from the Beavers captured at the mouth of the Rhone in France. Skins of Beavers from the Hudson's Bay region have yielded specimens while others from Alaska have given both Platypsylla and Leptinillus. Recently the Beavers of Texas have furnished specimens.

Miscellaneous Coleopterous Studies.

BY GEORGE H. HORN, M. D.

The following pages have not been used as the means of describing isolated species merely, although several have been included. From time to time the question is often asked as to the differences between closely allied species, more especially of those genera that have not been studied as a whole. As it is not always convenient to give in detail in letters to each correspondent the information desired, several studies, based on questions asked, have been made and are here presented for the benefit of all.

ANILLUS Duval.

A. explanatus n. sp.—Pale rufotestaceous, shining. Head rather large, frontal impressions deep and broad, surface smooth. Antennæ nearly half as long as the entire body, gradually thicker externally, the joints verticillate, the second longer and stouter than the third. Thorax trapezoidal, a little wider than long, sides arcuate anteriorly, oblique behind, the margin narrowly reflexed, but more broadly near the hind angles, these nearly rectangular, slightly obtuse, median line finely impressed, the space behind the posterior transverse impression somewhat depressed and finely rugulose. Elytra abruptly wider at base than the thorax, humeral angles prominent, but obtuse; general form oval, broadest in front of middle, the sides somewhat explanate from the humeri two thirds to apex external to a deep stria bearing subocellate punctures, the margin distinctly serrate near the humeri; disc moderately convex, the striæ nearly obsolete, forming an oval space at the middle of the surface, the first stria indistinctly punctured, the submarginal rather deep and with subocellate punctures; surface distinctly alutaceous near the base, smoother near the apex. Body beneath smooth. Legs slender, middle tibiæ broadened at basal half. Length .08 inch; 2 mm. Pl. iii, fig. 25.

One specimen, ♀, "Alabaster Cave," California.

The species of Anillus now known to inhabit our fauna are as follows:

Elytra somewhat explanate at the sides, the margin serrate near the humeri.
explanatus *Horn.*

Elytra of regular oblong oval form, the sides not explanate, margin not serrate.

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Thorax scarcely wider than long, obliquely narrowing to base, which is narrower than the apex. ..... **debilis** *Lec.*

Thorax very obviously wider than long.

Median line of thorax distinctly impressed, the base a little narrower than the apex ..... **fortis** *Horn.*

Median line scarcely visibly impressed, the base not narrower than apex. **Dohrni** *Ehlers.*

The first two species are from California, *fortis* from Tennessee, *Dohrni* from Florida. They are extremely rare in collections, their small size and mode of life rendering them difficult to collect.

ÆGIALITES Mann.

MENTUM twice as wide as long, sides irregularly converging to the front, apex truncate.

LIGULA short, transverse, feebly emarginate in front, the angles rounded, sparsely ciliate in front with two longer setæ each side.

MAXILLÆ with two distinct lobes, the inner narrow, parallel, apex obtuse, with a few spines and sparsely ciliate, outer lobe broader, but obtuse, with short spiniform hairs at the inner angle.

MANDIBLES rather stout, apex emarginate, inner edge deeply notched within the apex.

LABIAL PALPI short, three-jointed, arising behind the mentum on each side of the base of the ligula, last joint oval, rather longer than either of the others.

MAXILLARY PALPI four-jointed, first very short, second clavate third shorter, fourth fusiform, truncate, longer than either of the others.

The above details are intended to supply the deficiencies existing in the descriptions of the mouth parts of Ægialites. The accompanying figures (Pl. iii, fig. 23, *a*, *b*, *c*, *d*) will give a sufficiently accurate idea of the form of the mouth parts.

OTHNIUS Lec.

This name is introduced to call attention to the figures of the mouth parts, and to correct an error in the "Classification." The ligula does not have distinct paraglossæ. The first joint of the labial palpi is ciliate with moderately long fine hairs within, which are curved at their apices, giving the appearance of paraglossæ when the dissection is mounted in Canada balsam.

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In the figure of the mentum there will be observed a depression on each side of middle with a brush of short hairs at bottom. This is a male character, the female mentum being entirely plain. Pl. iii, fig. 24, *a*, *b*, *c*.

In *O. umbrosus* Lec. ♂, the foveæ are large and narrowly separated; in *longicornis* Horn they are small and widely separated, and in *lugubris* Horn the foveæ forms but one transverse depression. Males of *fasciatus* are not now before me.

O. guttulatus Lec. should be dropped from our lists, as there was never a type in hand from which to make a description.

LAGRIIDÆ.

This family is represented in our fauna by a small number of species which have never been treated collectively, consequently their determination is difficult, the names having been transmitted from one cabinet to another in a traditional manner.

Two genera are recognized in our fauna:

Head not constricted to a neck, eyes transverse, reniform, not prominent. **Arthromacra.**

Head constricted behind the eyes, which are large, convex and prominent. **Statira.**

The tibiæ are usually described as having no terminal spurs, but in all the species before me the spurs are distinct, but very small.

ARTHROMACRA Kby.

A. ænea Say (*Lagria*), Long's Exped. ii, p. 287; edit. Lec., i, p. 191; *donacioides* Kby., Fauna Bor. Am. p. 238.—Body beneath and legs dark bronze, above usually with brilliant metallic lustre, either blue, green, cupreous, or dark bronze. Antennæ reddish-brown, tarsi somewhat darker. Head and thorax sparsely punctate, the latter cylindrical, longer than wide, the base slightly expanded, lateral margin entirely obliterated. Elytra rarely with faint traces of striæ near the apex, the surface coarsely and moderately closely punctate, sometimes rugose. Body beneath very sparsely punctate. Length .37—.50 inch; 9.5—13 mm.

In the male the last joint of the antennæ is equal to the four preceding joints, in the female to three. The outer edge of the tibiæ is rounded, as in the majority of our species of Statira.

STATIRA Serv.

Our species are few in number, and may be distinguished in the following manner:

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Tibiæ sulcate on the outer edge.
Setigerous punctures of the alternate intervals numerous; tibiæ sulcate nearly their entire length ..... **pluripunctata.**
Setigerous punctures few, mostly on the third interval; tibiæ sulcate below apical half only ..... **subnitida.**
Tibiæ rounded on the outer edge, not sulcate.
Setigerous punctures numerous on first, third, fifth and seventh intervals. **opacicollis.**
Setigerous punctures entirely absent from first interval.
Thorax bright orange-red.
Legs piceous..... **resplendens.**
Legs pale yellow ..... **croceicollis.**
Thorax more or less piceous, body concolorous above.
Thorax polished, the punctures fine, but distinct; legs piceous, the basal half of femora and coxæ pale yellow..... **basalis.**

The first three species occur in Arizona and Lower California, and are without metallic lustre, the others belong to the Atlantic region, and have more or less metallic lustre.

S. pluripunctata n. sp.—Body beneath and legs reddish brown, abdomen and elytra piceous, surface opaque, without metallic lustre. Antennæ half as long as the body, brown or piceo-testaceous. Head scabrous, always darker in color in the male. Thorax longer than wide, sides feebly arcuate, the base slightly explanate, lateral margin rounded, without distinct edge even at base, surface scabrous, opaque. Elytra striate, striæ finely and closely punctate, intervals very slightly convex, the alternate intervals 1-3-5-7-9 with setigerous punctures extending from base to apex, but not closely placed, surface subopaque. Body beneath smooth, shining, Tibiæ sulcate their entire length on the outer side. Length .25—.37 inch; 6-- 9.5 mm.

The antennæ are a little more than half the length of the body, the terminal joint in the female equal to the three preceding joints.

The color described is that of fully mature specimens, but the majority of those before me are imperfectly piceous as in very many *gagatina*. The sulcation of the outer edge of all the tibiæ is seen in but one other of our species. It is probable that some of the Mexican species may have this character, but I have not found it mentioned. Only females have been seen.

Occurs in Arizona.

S. subnitida Lec. New Species 1866, p. 141.—Piceous or dark brown, subopaque. Antennæ paler brown. Head sparsely punctate. Thorax finely scabrous, lateral margin obliterated. Elytra striate, striæ closely, scarcely crenately punctured, first interval with but three setigerous punctures placed near the apex, third with six to eight from base to apex, fifth with about three near the apex, seventh and ninth without any, a few near the margin close to the apex. Body beneath smooth, feebly shining. Tibiæ grooved on their outer edge near the apex only. Length .28—.43 inch; 7—11 mm.

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The two specimens examined are the types in the collection of LeConte, both females. The terminal joint of the antennæ is equal to the three preceding. In one of the two specimens the thorax is distinctly longer than wide, the sides feebly arcuate, the other specimen is larger, thorax as wide as long, the sides arcuate.

This species occupies an intermediate position between *pluripunctata* and the species which follow, being related to the former by the grooved tibiæ, and to the latter by the very few setigerous punctures.

Occurs in Lower California.

S. opacicollis n. sp.—Piceous brown, shining, antennæ and legs much paler, head and thorax darker and opaque. Head sparsely punctate. Thorax longer than wide, sides very feebly arcuate, lateral margin slightly distinct, surface finely scabrous. Elytra striate, striæ crenately punctured, intervals slightly convex, the first, third, fifth and seventh with numerous setigerous punctures from base to apex, the ninth with few behind the middle, a few along the lateral margin behind the middle. Body beneath smooth, shining, paler than above. Outer edge of tibiæ rounded, not grooved. Length .35—.40 inch; 9—10.5 mm.

The antennæ are a little longer than half the body, the terminal joint in the male equal to five and the female to three preceding.

By its very numerous setigerous punctures this species is related to *pluripunctata*, but the tibiæ are simple, not grooved on the outer edge.

Occurs in Arizona (Morrison).

S. resplendens Mels. Proc. Acad. 1845, p. 311.—Piceous, shining, elytra with slight æneous lustre, thorax reddish yellow, legs piceous or paler. Antennæ piceous, scarcely half as long as the body. Head sparsely punctate. Thorax a little longer than wide, sides feebly arcuate, base slightly explanate, surface sparsely finely punctate. Elytra striate, striæ finely and closely, but not crenately punctured, intervals slightly convex, the first without setigerous punctures, the third and fifth with very few behind the middle, others close to the border near the apex. Body beneath nearly smooth, shining. Length .30 inch; 7.5 mm.

The antennæ are entirely piceous, the terminal joint equal to the five preceding in the male and three in the female.

In the short diagnosis given by Melsheimer the legs are said to be yellow, but in the more detailed description are pale brown. It is evident that he had immature specimens before him and did not properly discriminate.

Occurs in the Middle States region.

S. crocicollis Mäkl., Acta Fenn. 1863, p. 594.

Closely related to the preceding species and differing in the following particulars:

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Elytra distinctly blue, the first interval without setigerous punctures, the third and fifth with about eight placed from the base to apex, seventh interval without, ninth with five or six in its apical half. Legs and coxæ pale reddish-yellow. Length .28—.37 inch; 7—9.5 mm.

The antennæ are not quite half the length of the body, the terminal joint in the male equal to five preceding and in the female to three and a half.

Occurs in the southeastern Atlantic region, Florida, Georgia and Alabama.

S. gagatina Mels., Proc. Acad. 1845, p. 311.—Piceous shining, elytra with faint metallic lustre. Antennæ brown. Head sparsely punctate. Thorax very feebly shining, the surface finely alutaceous, the punctuation indistinct, except that in a few specimens some larger punctures are seen near the base. Elytra moderately deeply striate, the striæ finely crenately punctured, intervals slightly convex, the first without setigerous punctures, the third and fifth with very few, seventh without any as also the ninth, a few close to the margin near the apex. Body beneath almost perfectly smooth. Length .25—.31 inch; 6.5--8 mm.

The specimens from the Middle States region are moderately shining and with quite distinct metallic lustre of surface. Three from Texas are distinctly less shining.

In the antennæ of the males of the northern form the terminal joint is about equal to five preceding joints, while in the Texas form it is fully equal to six. In the females of both the last joint equals the three preceding. These seem to be probably local varieties, at all events having but one ♂ of the Texas form, it is not possible to say if the variation is constant. In this species the legs are uniform in color, in the fully developed specimens piceous, varying to piceo-testaceous in the less mature forms.

In the specimens collected by Mr. Ulke, near Washington, the thorax is very often quite pale, contrasting very decidedly with the color of the elytra, but there is never that reddish-yellow seen in *resplendens* and *croceicollis*, nor are the elytra ever of the bright metallic lustre.

Occurs from the Middle States to Texas.

S. basalis n. sp.—Piceous, shining, elytra with distinct metallic blue lustre, legs piceous, the femora at base and coxæ testaceous. Antennæ brown. Head with very few punctures, eyes large and very convex, the posterior canthus very small. Thorax not longer than wide, sides feebly arcuate, base slightly explanate, disc very shining, the punctures small, but distinct. Elytra moderately deeply striate, the striæ crenately punctured, intervals slightly convex, the first without setigerous punctures, third and fifth with very few, seventh and ninth without any, a few close to the margin near the apex. Body beneath smooth, shining. Length .30—.40 inch; 7.5—10 mm.

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The antennæ are about half the length of the body, the last joint in the male fully as long as seven preceding joints, while in the female it equals very nearly four.

While closely related to *gagatina* it seems quite a distinct species by the characters above given. Although the eyes are large in all the species, in this one they are especially so, the portion of the head which usually forms quite a conspicuous border behind the eye is here much reduced.

Occurs in Georgia, Florida and Louisiana.

It seems worthy of remark that the species of this genus have one or rarely two setigerous punctures on each side of the abdominal segments placed in the same position as in the Carabidæ.

MELANDRYIDÆ.

EUSTROPHUS Latr.

This genus contains but few species, the majority of those described being members of our fauna. As in the case of Statira the descriptions are scattered, somewhat indefinite, and from their isolation very little comparative. As the majority of the species are known in nearly all collections, and as the knowledge of them is purely traditional, it is now proposed to give a few comparative notes.

In the first place it has been observed that two species differ notably from the others in the form of the prosternum and absence of striæ of punctures, it is therefore proposed to divide the genus in the following manner:

Prosternum narrowing to a point and not prolonged behind the coxæ; elytra with striæ of moderate or coarse punctures..... .. .. **Eustrophus.**

Prosternum prolonged behind the coxæ and separating them, the apex somewhat broader; elytra finely, confusedly punctured ..... **Holostrophus.**

As restricted above, Eustrophus contains a small number of very closely related species difficult to separate by superficial comparison, and of almost impossible recognition from the descriptions. The following table and notes may, therefore, be of some service.

The eyes vary in size in two ways. Those species which are distinctly narrowed posteriorly have large eyes very narrowly separated on the front. In the species which are obtuse posteriorly the eyes are smaller and widely separated on the front.

In all the species but one the middle and posterior tibiæ have, on their outer edge, numerous transverse ridges, recalling those of Mor-

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dellistena, bearing short, closely placed spinules. In *repandus* these ridges are obliterated to such an extent that scarcely any traces can be observed.

The underside of the prothorax shows two forms of sculpture—that in which the surface is shining and the punctures simple, although closely placed, and that in which the surface is opaque and rather roughly granulate-punctate.

These characters afford the means of arranging the species in tabular form with a sharpness of definition that will enable them to be readily determined.

The following is the arrangement proposed:

Eyes narrowly separated, sometimes almost contiguous on the front; form distinctly narrower posteriorly.....2.
Eyes widely separated on the front; form very little narrowed, obtuse posteriorly*.....4.
2.—Middle and posterior tibiæ without distinctly defined transverse ridges; body beneath and legs piceous.....**repandus.**
Middle and posterior tibiæ with distinct transverse ridges on their outer edge.....3.
3.—Underside of prothorax densely roughly punctured; legs and body beneath piceous.....**arizonensis.**
Underside of prothorax shining, closely, but not roughly punctured; legs and abdomen pale brown or reddish.....**bicolor.**
4.—Piceous black; prothorax beneath shining, the punctures close, but not rough. **confinis.**
Brown; prothorax beneath densely, roughly punctured.....**tomentosus.**

E. repandus n. sp.—Oval, convex, distinctly narrowed posteriorly, moderately shining, sparsely clothed with short blackish hair. Antennæ dark brown or black, the four basal joints paler, apical half of last joint yellow. Eyes very narrowly separated on the front. Thorax densely punctured, the basal impression on each side moderately deep, short. Elytra striato-punctate, the punctures moderately coarse and close, but become rapidly finer, so that at apical fourth they are hardly distinguished from the interstrial punctures which are densely placed on the flat intervals. Prosternum densely punctured, the side pieces more finely slightly shining, sparsely pubescent. Body beneath and abdomen densely punctured. Legs black, the tarsi brown. Middle and posterior tibiæ without transverse setigerous ridges. Length .24—.28 inch; 6--7 mm.

While this species is usually entirely black, the abdomen is occasionally brown, but never so pale as in *bicolor*, nor are the legs ever pale.

* To this series *E. dermestoides*, of Europe, should be referred. From the descriptions the eyes are even more widely separated than in our species.

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This species is universally mixed with *bicolor* in collections, but may be known by the entire absence of the tibial ridges, the dark legs and by only the half of the terminal joint of the antennæ yellow.

Its distribution seems to be across the northern half of our country from Canada and New Hampshire to Virginia, and from these points through all the States to the Pacific coast as far south as the extreme north of California.

E. arizonensis n. sp.—Oval, distinctly narrower behind, moderately convex, black, feebly shining, clothed with very short black hair. Eyes narrowly separated. Antennæ black, the four basal joints ferruginous, the last joint entirely yellow. Thorax very closely and finely punctured, the basal impressions vague. Elytra striato-punctate, the punctures moderately coarse and close, becoming finer toward the apex, but easily distinguishable from the interstrial punctures, which are finer and closely placed. Prosternum coarsely and closely punctured, the side pieces densely and roughly punctured and subopaque. Body beneath densely punctured, the abdomen very finely. Legs black-brown, middle and posterior tibiæ with distinct transverse ridges bearing very short, closely placed setæ. Length .26—.30 inch; 6.5—7.5 mm.

This species is the largest known in our fauna. It is rather less attenuate behind than *bicolor* and *repandus*. As in *bicolor* the punctures of the striæ extend distinctly to the apex. From either of the two species cited it differs in the roughly sculptured underside of the prothorax.

The eyes are a little more widely separated than in either *bicolor* or *repandus*, but the distance between the eyes is scarcely more than one-third the width of either eye as seen from above.

Occurs in Arizona and New Mexico.

E. bicolor Fab. (*Mycelophagus*), Ent. Syst. i, 2, p. 497; Syst. El. ii, p. 566; *indistinctus* Lec., Ann. Lyc. v, 1851, p. 151.—Oval, convex, distinctly attenuate posteriorly, black, shining, sparsely pubescent, abdomen and legs ferruginous. Antennæ black, four basal joints reddish, terminal joint entirely yellow. Eyes very narrowly separated. Thorax shining, the punctures fine and close, but not dense, basal impressions vague. Elytra striato-punctate, the punctures moderately coarse, but becoming finer posteriorly, but still quite distinct near the apex, the interstrial punctures close, but not dense nor rough. Prosternum moderately coarsely punctured, the side pieces finely and shining. Body beneath and abdomen rather densely punctured, middle and posterior tibiæ with well marked transverse ridges with short, closely placed setæ. Length .20—.24 inch; 5—6 mm.

Some specimens collected by me in very early spring, in Arizona, have a decidedly brownish color above, although the abdomen and

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legs are still paler. These are probably merely less mature specimens as no other structural differences have been observed.

With this species I have united *indistinctus*, as there are no valid differences.

In the two preceding species I have alluded to the characters separating them from *bicolor*.

In its distribution *bicolor* occupies the region more generally south of that occupied by *repandus*. It extends from the New England States southward through Virginia, thence westwardly to Arizona. It occurs also in Kansas.

E. confinis Lec., New Species 1866, p. 152.—Oval, convex, nearly equally obtuse at both extremities, black, moderately shining, sparsely clothed with short black hair. Antennæ brownish-black, the basal joints scarcely paler. Eyes widely separated on the front. Thorax finely and closely punctured, the basal impressions feeble. Elytra striato-punctate, the punctures moderately coarse and close, becoming finer toward the tip, but distinct, except at the apex; the interstrial punctures close and slightly rough. Prosternum rather coarsely and closely punctured, the side pieces more finely punctured, not rugose, moderately shining. Body beneath and abdomen densely punctured, the latter more finely. Middle and posterior tibiæ with distinct ridges on the outer edge. Length .24 inch; 6 mm.

This species differs from all the other black ones in our fauna by its form, the rather widely separated eyes and the almost uniform color of the antennæ. The eyes are nearly as widely separated as the width of either eye as seen from above.

Occurs in Canada, Wisconsin and Nebraska.

E. tomentosus Say, Journ. Acad. 1827, p. 293; edit. Lec., ii, p. 305; *niger* Mels., Proc. Acad. 1846, p. 58.—Oval, moderately convex, equally obtuse at either extremity, brown, moderately shining, with short brown pubescence, body beneath and legs a little paler than above. Antennæ uniformly pale brown. Eyes as widely separated on the front as their own width. Thorax closely, not densely punctured, the basal impressions very indistinct. Elytra striato-punctate, the punctures not coarse, becoming fine posteriorly, and at apical third not distinguishable from those of the intervals, these latter dense and somewhat rough. Prosternum coarsely punctured, the side pieces granulate-punctate and subopaque. Abdomen densely and somewhat roughly punctate. Middle and posterior tibiæ with distinct transverse ridges on their outer edge. Length .18—.20 inch: 4.5—5 mm.

This species is scarcely at all variable. The eyes are more widely separated than in any other Eustrophus and approach the form seen in Holostrophus. The underside of the thorax is even more roughly sculptured than in *arizonensis*.

Occurs from the New England States westward to Dacota and Iowa.

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HOLOSTROPHUS n. g.

Under this name I have separated three species which differ as follows, while possessing, otherwise, the characters of Eustrophus:

Eyes very widely separated on the front, scarcely emarginate in front and not prolonged over the insertion of the antennæ. Last joint of maxillary palpi oval, obliquely truncate (cylindrical in Eustrophus). Prosternum more widely separating the coxæ, prolonged behind them and slightly broader at apex. Mesosternum prolonged in an obtuse keel, but not mucronate at apex. Fourth joint of antennæ not shorter than the fifth. Elytra without striæ of punctures. Middle and posterior tibiæ without ridges on outer edge.

The species here referred may be separated in the following manner:

Apex of prosternum distinctly margined at tip and sides.
  Surface very densely and finely punctured; color uniformly brown; basal impression of thorax linear ..... **impressicollis.**
Apex of prosternum not margined.
  Surface densely, but not very finely punctured; color brown, elytra with two wide yellow bands, broadly interrupted by the suture; basal impression of thorax linear..... **bifasciatus.**
  Surface more coarsely, not densely punctured; color brown, the elytra gradually paler to base; basal impression of thorax very vague, somewhat triangular..... **discolor.**

H. impressicollis Lec. (*Eustrophus*), Trans. Am. Ent. Soc. 1874, p. 69.—Elongate-oval, depressed, distinctly narrowed posteriorly, brown, feebly shining, sparsely clothed with short brown pubescence. Antennæ reddish-brown, the last joint a little paler. Eyes entirely lateral, not extending above the insertion of the antennæ. Thorax very finely and moderately densely punctured, the basal impressions rather long, linear and sharply defined. Elytra punctured similar to the thorax, a faint trace of a sutural stria. Prosternum coarsely punctured, the apex rounded and distinctly margined, the side pieces densely and finely punctured. Metasternum at sides rather coarsely punctured. Abdomen densely and very finely punctured. Length .20 inch; 5 mm.

In this species the antennæ are rather more slender than the other two, the outer joints being less transverse. The uniform color of the body and the fine, dense punctuation will enable this species to be at once known.

Occurs in Nevada, Vancouver and Washington Territory. Three specimens have been seen in the collections of Dr. LeConte and myself.

H. bifasciatus Say (*Eustrophus*), Long's Exped. ii, 1824, p. 282; edit. Lec. i, p. 186; *quadrimaculatus* Mels., Proc. Acad. 1846, p. 58.—Oval, distinctly narrowed posteriorly, moderately convex, reddish-brown, elytra piceous, with two broad yellow bands interrupted at the suture, surface moderately shining, clothed

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with short pubescence of the color of the surface. Antennæ pale reddish-brown, the terminal joint somewhat paler. Eyes entirely lateral. Thorax finely and closely punctate, the basal impressions short and linear. Elytra closely finely punctate, the punctures slightly muricate. Prosternum coarsely punctate, the apex oval acute, not margined, the side pieces less coarsely punctate, but more closely. Metasternum coarsely sparsely punctate. Abdomen densely punctured, the punctures very fine at apex, becoming gradually coarser toward the base. Length .16—.20 inch; 4—5 mm.

The outer joints of antennæ 8–9–10 are transverse, the tenth twice as wide as long. The yellow fasciæ are broadly interrupted at the suture, and their edges are somewhat sinuous, especially in the case of the anterior one.

Occurs from Massachusetts to Virginia and Tennessee.

H. discolor n. sp.—Oval, convex, distinctly narrowed posteriorly, reddish-brown beneath, darker above, the elytra gradually paler to base, surface moderately shining, sparsely clothed with short brownish hair Antennæ with first five and the last joint reddish-yellow, the intermediate joints piceous. Head moderately coarsely punctate, eyes entirely lateral. Thorax relatively coarsely not closely punctate, with few extremely fine interstitial punctures, basal impressions vague. Elytral punctures a little coarser than those of the thorax and not closely placed. Prosternum sparsely distinctly punctate, the apical prolongation obtuse and not margined, the side pieces coarsely sparsely punctate in front, smooth behind. Metasternum coarsely sparsely punctate. Abdomen more closely and finely punctate. Length .14—.16 inch; 3.5—4 mm.

This species is similar in form to *bifasciatus*. The punctuation of the surface, although not coarse, is very conspicuous, and seems coarse in comparison with that of the other species. The antennæ have the bicolored tendency of Eustrophus. The thorax is dark brown, the elytra reddish-brown, becoming paler to the base.

Two specimens collected in Virginia by Mr. Ulke, to whom I must again acknowledge my indebtedness, not only for one of these specimens, but also for the great freedom permitted in the use of his cabinet during a recent visit.

ORCHESIA Latr.

Hitherto but two species have been known in our fauna so nearly alike, except in size, that many collectors doubt their specific distinctness. The occurrence of a new species in the Pacific region affords the opportunity for giving the differences between them all.

Prosternum between the coxæ very narrow and acute at apex.

Luteous or ochreous, the elytra ornate with piceous spots and a fascia. **ornata.**

Castaneous or brown, uniform..... **castanea.**

Prosternum between the coxæ broader and parallel, the apex obtuse.

Castaneous or brown, uniform..... **gracilis.**

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The species are remarkable in having the spurs of the middle and posterior tibiæ finely pectinate on their inner or lower edge. The last two species have the eyes moderately closely approximate on the front, while in *ornata* they are distant. For the Scandinavian species of the former type Thomson (Skand. Col. vi, p. 306) retains the name Orchesia, while for the ornate form Clinocera is used. The latter name has not been generally adopted.

O. ornata n. sp.—Very elongate oval, narrower behind, luteous or ochreous, moderately shining, surface clothed with fine yellowish pubescence, elytra with piceous markings. Front densely punctured, three vague impressions, one near each eye, a third on the occiput. Thorax much broader than long, sides arcuate, broadest slightly in front of the middle, surface densely punctured, the basal impressions well marked and oblique. Elytra densely punctured, slightly rugulose near the base, an oval, oblique piceous spot on each elytron near the base, a sinuous fascia one-third from apex, a small piceous spot close to the apex. Body beneath densely punctured, the abdomen very finely. Prosternum very narrow at tip and acute. Length .18 inch; 4.5 mm.

This species is the first representative of the genus from the west coast. The eyes are more distant on the front than in either of the other species, and, in view of a similar occurrence in Eustrophus, does not seem to warrant the division of the genus. That the elytra are ornamented with a design adds another to the many evidences of the similarity of our west coast fauna to that of Europe.

Occurs in Washington Territory and Oregon.

O. castanea Mels., Proc. Acad. 1846, p. 51.—Elongate, scarcely more acute posteriorly, castaneous or brown, pubescence silken brown. Eyes closely approximated on the front. Thorax rather coarsely punctured near the base, more finely in front, the basal impressions vague. Elytra punctured similarly to the thorax, the punctures gradually finer to the apex. Body beneath very closely punctate, the abdomen more finely. Prosternum narrow and acute at apex. Length .14—.20 inch; 3.5—5 mm.

Occurs from Massachusetts to Michigan, southward to Virginia.

O. gracilis Mels., loc. cit.—Similar to *castanea*, but more slender, more narrowed posteriorly, sculpture coarser and more rugose; basal impressions of thorax indistinct. Prosternum parallel between the coxæ and obtuse at tip. Length .14—.16 inch; 3.5—4 mm.

The differences between this species and the preceding are more entitled to generic value than those used to separate species of the *ornata* type.

Occurs from Pennsylvania to Louisiana.

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HYPULUS Payk.

This name is here adopted as the correct name of the genus, Dircæa often used, having for its undoubted type *barbatus*, which is in turn the type of the older genus Serropalpus.

In examining the characters used by authors in separating Dircæa and Phlœotrya there does not seem to be any difference. Lacordaire uses the insertion of the antennæ which is entirely illusory. Duval finds the maxillary palpi distinctly dentate in Phlœotrya and the anterior tarsi not dilated, while in Dircæa the palpi are distinctly dentate and the tarsi dilated. These are purely sexual characters. The males of all the species studied in our fauna have the palpi more serrate, the last joint longer, the anterior tarsi dilated. Thomson (Skand. Col. vi) adopts Mulsant's determination of the genera and his Hypulus does not contain the Paykull type.

In our books the name Hypulus should replace Dircæa, and Mystaxus replace Hypulus. Mystaxus *Kug.* has never been characterized by that author, but has been sufficiently described since, and the name is certainly as well worthy of adoption as many of the Erichson genera, which pass without question.

In all the species before me the males have the anterior tarsi rather widely dilated and the last ventral segment truncate or emarginate. In the males of *fusca* the ventral segments 2–3–4 have a transverse space at middle more densely and finely punctured and with the pubescence denser. Unfortunately, the male of *Vaudoueri* sent me by Fauvel has no abdomen, although it is quite certain that this and *fusca* are identical.

The species known to me are as follows:

Marginal line of thorax not visible in front of the middle of the sides.....2.
Marginal line entire, reaching the apex. .....3.
2.—Thorax rather roughly granulate, elytra densely and finely punctured. **pronus.**
Thorax simply punctured.
Elytra entirely piceous.....**Riversii.**
Elytra with two yellow bands.....**bicinctus.**
3.—Antennæ slender, joints longer than wide.
Thorax shining, simply punctate; elytra ornate with yellow spots of irregular shape.....**lituratus.**
Thorax opaque rugulose, elytra brown.....**Vaudoueri.**
Antennæ with joints somewhat triangular, nearly as wide as long. **concolor.**

H. pronus Lec. (*Dircæa*), Proc. Am. Philos. Soc. 1878, p. 426.

Our largest species; of uniform ferruginous brown color and fine

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pubescence. It is very obtuse in front, the head strongly deflexed. Length .48 inch; 12 mm.

Occurs at Enterprise, Florida.

H. Riversii Lec. (*Dircæa*), Trans. Am. Ent. Soc. 1884, p. 29 (posthumous).

Dark brown or piceous, moderately shining, the pubescence short, sparse and indistinct. Similar in form to *lituratus*. Length .32—.44 inch; 8—11 mm.

In this species the punctuation of the thorax is coarser than in any other, although preserving its simple and distinct character. On the elytra the punctuation at base is somewhat intermixed, but not to the extent observed in *lituratus*.

Occurs in California, Sylvania. A number of specimens have been sent me by Mr. Rivers, the males three times more numerous than the females.

H. bicinctus n. sp.—Elongate, scarcely narrowed behind, moderately convex, piceous, moderately shining, very finely and sparsely pubescent, thorax margined at base and apex with yellow, elytra with two yellow bands. Antennæ slender, piceo-testaceous. Head vertical, not visible from above, densely and finely punctured. Thorax not longer than wide, narrower in front, sides regularly arcuate, base truncate and slightly narrower, surface moderately densely and finely punctured, the basal impressions absent. Elytra finely and closely punctate, the punctures less distinct toward the apex, color piceous, a broad yellow band on each elytron arcuate, convex in front, not reaching the suture, one-third from base, a second narrow sigmoid band one-third from apex crossing the suture. Body beneath finely, but moderately punctate. Legs brownish. Length .14 inch; 3.5 mm.

This species is the smallest known to me. It is the second of the group discovered on the Pacific coast, and is rather of the type of some of the European species. The lateral margin of the thorax is distinct near the base only, and the marginal line does not extend in front of the middle. This structure is also observed in the two preceding species.

Occurs at Sylvania, California. L. E. Ricksecker.

H. lituratus Lec. (*Dircæa*), List. Col. N. A. p. 66; *quadrimaculatus* ‖ Say (*Serropalpus*), Long's Exp. ii, p. 283; edit. Lec., i, p. 187; Hald., Journ. Acad. 1848, p. 98.—Elongate oval, narrower behind, convex, brown or piceous, moderately shining, sparsely pubescent. Antennæ uniformly brown. Thorax with apical border pale, surface moderately closely and finely punctate, not rugulose, the marginal line entire. Elytra moderately closely punctate, somewhat smoother posteriorly, the punctures near the base unequal, color brown, with a yellow spot behind the humeri somewhat in shape like the letter H with the transverse bar broad, posteriorly a sinuous band one-third from apex interrupted at the suture. Body beneath densely and finely punctured, the abdomen similarly punctured in the sexes. Length .30—.44 inch; 7.5—11 mm.

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In the males the anterior tarsi are dilated as usual, and the last ventral segment emarginate. The markings vary somewhat on the elytra, but not greatly from that described.

Occurs from Canada to Virginia and Missouri. The males seem the more rare.

H. Vaudoueri Muls. (*Phlœotrya*), Col. Fr. Barbip. p. 79, pl. i, fig. 11; *fusca* Lec. (*Dircæa*), Proc. Am. Philos. Soc. 1878, p. 619.—Elongate, cylindrical, slightly depressed, dark brown, feebly shining, sparsely clothed with short brown pubescence. Antennæ slender, ferruginous, outer joints all longer than wide. Front moderately closely punctate. Thorax usually a little longer than wide, apical margin usually paler, surface densely punctured, opaque, more or less rugulose, sometimes slightly confluent transversely, the basal impressions wanting or very vague. Elytra with very vague costæ, the surface less coarsely punctured than the thorax, except near the base, toward the apex the punctures become rapidly finer and the surface more shining. Body beneath moderately coarsely punctured, the abdomen more densely and finely. Legs reddish-brown. Length .28—.37 inch; 7—9.5 mm.

In the males the anterior tarsi are dilated, the last ventral segment emarginate. Segments 2-3-4 of the abdomen have at middle a transverse space of denser punctuation and pubescence.

By means of a specimen kindly sent me by Mr. Fauvel I am enabled to realize the identity of our species with that previously described by Mulsant in Europe.

This species seems very rare in Europe, and is by no means commonly met with here, although widely diffused, and differs slightly in the various localities. In some specimens the thorax is very distinctly rugulose, almost finely granulate, in others the punctuation is almost simple. As a general rule the larger specimens have the rougher thorax, the costæ of the elytra more distinct and the basal foveæ of thorax more evident.

From a study of my specimens and a reading of Duval's account of the differences between *Vaudoueri* and *Stephensii*, it seems that these should be carefully studied before further continuing them as distinct.

Our species extends across the continent from Nova Scotia to California, and as far south as North Carolina.

H. concolor Lec. (*Dircæa*) New Species, 1866, p. 149.

Very similar in form and color to the preceding species, but much smaller, differing especially in the following particulars:

Antennæ very little longer than the head and thorax, piceous, the three basal joints testaceous, joints 6—10 not longer than wide. Legs fuscous, the tarsi paler. Length .25 inch; 6 mm.

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The males have the anterior tarsi dilated and the last ventral feebly emarginate. The segments 2–3–4 have the densely punctured and pubescent transverse space extending nearly from side to side, although interrupted at middle.

Two specimens have been seen, both from Pennsylvania. I am indebted to Mr. Ulke for the loan of his specimen.

MALLODRYA n. g.

Form elongate, not very convex, recalling *Melandrya* or *Emmesa*. Maxillary palpi robust, not serrate, the last joint triangular, the distal side arcuate. Mandibles entire at apex. Labrum moderately prominent, entire. Eyes oval, lateral, slightly emarginate by the sides of front. Head prominent, very slightly narrowed behind the eyes, these distant from the thorax, the frontal suture distinct. Antennæ reaching the hind angles of the thorax, not thicker externally nor serrate, first joint conical, second small oval, third longest, fourth slightly shorter, joints 4–10 gradually shorter, eleventh longer, oval. Anterior coxæ oval, moderately prominent, narrowly separated by the acute prosternum, the coxal cavities with a very slight fissure externally, the trochantin not visible. Middle coxæ not prominent, separated by the mesosternum, which is slightly oblique in front, the coxal cavities open externally, the trochantin visible. Metasternum of moderate length, the side pieces rather wide. Legs moderate, tibial spurs short, tarsi slender, the penultimate joint not excavato-emarginate nor lobed beneath. Tarsal claws simple, merely slightly broader at base.

This genus is instituted for a rather inconspicuous species resembling a depressed Melandrya or an Emmesa, which cannot be made to enter any of the recognized subdivisions of the family. While related by many of its characters to Melandrya and the closely associated genera, it differs from all of them by the slender tarsi, the penultimate joint not being excavato-emarginate and the anterior tarsi not dilated in the males.

M. subænea n. sp.—Oblong, moderately convex, piceous with faint æneous surface lustre, moderately shining, with short, sparse brown hair Head moderately coarsely and closely punctate. Thorax nearly twice as wide as long, narrower at apex, sides arcuate in front, a very slight sinuation posteriorly, the hind angles rectangular, margin distinct in its entire extent, disc moderately convex, median line distinctly impressed, basal impressions deep and rather broad, extending in front of middle, surface moderately coarsely and closely punctate, base bisinuate. Elytra coarsely and moderately deeply punctate, closely placed in the basal and scutellar regions, then gradually finer and sparser toward the

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sides and apex. Body beneath piceous, coarsely punctate, the sides of the prothorax especially so, the abdomen more finely, with sparse pubescence. Legs piceous. Length .25—.34 inch; 6--8.5 mm.

The elytra have no traces of striæ and the costæ so often observed in the family are entirely wanting.

Occurs in southern Ohio collected by Mr. Charles Dury.

A recent study of the Melandryidæ makes it evident that the subdivisions are somewhat unnatural. By the removal of those genera with slender tarsi the relationship of the tribes to each other becomes more evident and the genera have a more natural sequence.

The following is the scheme proposed:

Penultimate joint of all the tarsi simple; the anterior tarsi of male not dilated..2.
Penultimate joint of the tarsi excavato-emarginate,* more or less lobed beneath; anterior tarsi of males dilated. .....5.
2.—Tarsal claws cleft to the base; middle coxæ prominent and contiguous. **Stenotrachelini.**
Tarsal claws not cleft; middle coxæ not prominent, separated.....3.
3.—Antennæ with last four joints suddenly larger, forming a perfoliate club. **Tetratomini.**
Antennæ gradually thicker, or filiform.....4.
4.—Front coxal cavities with an external fissure, more or less distinct.
Third joint of antennæ elongate; anterior coxæ not prominent, separated by prosternum..... **Penthini.**
Third joint of antennæ not much longer than fourth.
Anterior coxæ not prominent, rather widely separated... **Synchroini.**
Anterior coxæ moderately prominent and nearly contiguous. **Mallodryini.**
Front coxal cavities without fissure..... **Orchesiini.**
5.—Tarsal claws simple, or very slightly broader at base.
Head not constricted behind..... **Melandryini.**
Head suddenly constricted behind the eyes..... **Scraptiini.**
Tarsal claws appendiculate.
Middle coxal cavities enclosed by the sterna, the head more or less prolonged in a beak; margin of thorax evident at base only. **Mycterini.**
Middle coxal cavities open externally, head not prolonged; lateral margin of thorax entire, acute..... **Nothini.**

STENOTRACHELINI. This tribe remains as at present in the books and contains *Stenotrachelus* and *Scotodes*, each represented by one species.

TETRATOMINI consists of the single genus *Tetratoma* with three species.

* *Serropalpus* and *Allopoda* make a slight exception, the penultimate joint of the hind tarsi being simple.

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PENTHINI is represented by *Penthe* with two species.

SYNCHROINI, *Synchroa* with one species.

MALLODRYINI is instituted for a new genus, *Mallodrya*, with one species, with which I am at present inclined to associate *Sphalma quadricollis*, formerly placed in the Pythidæ.

ORCHESIINI remains the same as in the Classification, with the addition of *Holostrophus* formed by the division of *Eustrophus*.

MELANDRYINI by the removal of certain disturbing elements formerly considered as subordinate groups, the Melandryini form a very homogeneous central series in the family. With an increase of species it is not quite so easy to subdivide the tribe into subordinate groups, but there are three fairly indicated groups illustrated by *Melandrya*, *Serropalpus* and *Hypulus*.

SCRAPTIINI remains as at present constituted.

MYCTERINI is unchanged.

NOTHINI contain the genus *Nothus* alone. There is not perfect accord as to the name. *Osphya*, often used is merely a name mentioned in a foot note. Four years later Olivier gave the name *Nothus* with a description sufficient at the time, and I think, with Lacordaire, that the name should be adopted.

PYTHIDÆ.

TRIMITOMERUS n. g.

Mentum transverse, concave, truncate in front, ligula short, palpi three-jointed, the first two equal, the third slightly longer. Maxillary palpi not elongate, four-jointed, first joint short, second twice as long, third shorter than second, fourth as long as second, compressed cylindrical, slightly broader toward apex. Mandibles prominent, stout, acute at tip, a tooth within the apex. Labrum short, broadly emarginate. Head rather large, slightly narrowed behind the eyes. Eyes large, prominent, coarsely granulated and very slightly emarginate in front. Antennæ long, first joint stout, but not long; joints 2–8 moniliform, the third slightly longer, joints 9–11 elongate, together twice as long as the preceding joints, joints 9–10 nearly equal in length their inner apical angle somewhat prolonged, joint 11 nearly as long as the two preceding, broader at its basal half. Thorax oval, slightly transverse, lateral margin very obtuse. Scutellum rounded at tip. Elytra widest at base, gradually narrowed to apex. Anterior coxæ conical, prominent and contiguous, the prosternum very narrowly prolonged between them. Mesosternum horizontal, the

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coxæ conical, oblique, contiguous, the cavities narrowly separated. Legs slender, moderately long. Tarsi slender, the last joint longer on the front and middle feet, first joint longer on the hind feet.

The head and thorax in form are not unlike that of Crymodes, the elytra are, however, narrowed toward the apex, being quite exceptional in the family. The general organization is that of the true Pythidæ as defined by Lacordaire. The antennæ are, however, very remarkable, and are not unlike those of many genera of Anobiini. The first eight joints are smooth with a few hairs, the last three opaque, the surface very finely punctured and apparently sensitive.

T. Riversii n. sp.—Moderately elongate, dark castaneous, elytra yellowish testaceous, surface shining. Head brown, densely coarsely punctured posteriorly, more sparsely in front, a slight concavity at middle of clypeus. Thorax castaneous, shining, sparsely punctate, disc slightly flattened, a vague oblique depression each side of middle, the two converging posteriorly. Elytra yellowish testaceous or luteous, very shining, punctures rather sparse and indistinct at base, more distinct near apex, margin with short ciliæ. Body beneath piceous, nearly smooth. Abdomen darker. Legs brown. Length .47 inch; 12 mm. Pl. iii, fig. 26.

The specimen before me is a male. The last ventral segment is broadly, but rather deeply triangularly emarginate, the last dorsal slightly emarginate. It is possible that the form of the antennæ may be merely sexual, or at least the female antennæ may not have the last three joints so elongate.

One specimen from Arizona kindly given me by Mr. J. J. Rivers, of the University of California.

PYTHO Latr.

The species of this genus, although few in number, seem to be misunderstood, more from the fact that the descriptions are scattered than from any real trouble in separating them. The following notes will assist in the determination:

Base of thorax constricted, forming a collar; median line of thorax broad and deep ..... **strictus.**

Base of thorax not constricted, the sides arcuate from the front to hind angles; median line of thorax fine.

Color, when mature, black, shining; legs black, surface without metallic lustre; prosternum in front and gula not punctate ..... **niger.**

Color piceous or castaneous; legs and underside reddish-yellow, surface blue or violet, even when partly immature; prosternum more or less punctate, gula transversely wrinkled ..... **americanus.**

P. strictus Lec., New Species, 1866, p. 168.

All the specimens seen are brownish with paler elytra, the surface without metallic lustre.

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This species is the representative in our fauna of *kolvensis* Sahlb. The latter does not have the thorax constricted at base, but the median line is broad and the middle of the disc depressed below the level of the sides as in *strictus*.

Occurs from Canada to Pennsylvania.

P. americanus Kby., Faun. Bor. Am. iv, p. 165; *deplanatus* Mann., Bull. Mosc. 1853, iii, p. 268.

Beneath, legs and antennæ rufous, head and thorax piceous, elytra somewhat paler, surface with a bluish or violet lustre.

Varies with the elytra, or even the entire surface pale.

This species represents, in our fauna, *depressus* Linn., of Europe, and may even be identical with it.

The form described by Mannerheim is merely a poorly developed, immature specimen; similar have been seen.

Occurs from Canada to North Carolina.

P. niger Kby., Faun. Bor. Am. iv, p. 164.

Black, shining, without metallic lustre; legs black or brown.

In this species the underside may be paler, but never as pale as in *americanus*.

Occurs from Canada to New England States.

In the males of Pytho the antennæ are longer than in the female, joints 1–6 being very obviously longer than wide, 7–10 as wide as long, 11 longer. In the female joints 1–5 are longer, 6–10 wider than long, 11 a little longer. In nearly all females the base of the elytra is smooth, while in many males it is distinctly punctured.

PYROCHROIDÆ.

DENDROIDES Latr.

The species are separable in the following manner:

Thorax rather coarsely punctate.
  Elytra piceous.
    ♂. Ramus of third antennal joint arising very near the distal end; last joint scarcely as long as the three preceding.....**bicolor** ♂.
    ♀. Free angle of third joint distinctly prolonged; last joint equal to two preceding.....**bicolor** ♀.
Thorax smooth and shining.
  Elytra piceous.
    ♂. Ramus of third joint arising near the distal end; last joint as long as the five preceding.....**picipes** ♂.
  Elytra testaceous.

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Thorax distinctly longer than wide.

♂. Ramus of third joint arising a little behind the distal end; last joint as long as the five preceding.....**concolor** ♂.

♀. Third joint distinctly prolonged, the fourth with a process half as long as the fifth joint; last joint as long as the two preceding.
concolor ♀.

Thorax as wide as long.

♂. Ramus of third joint near the end; last joint as long as the four preceding.....**ephemeroides** ♂.

♀. Joints 3-4-5 with free angle not prolonged, the sixth slightly, the rami of the following joints gradually longer, but in no case longer than the joint; last joint as long as the two preceding.
ephemeroides ♀.

D. bicolor Newm., Ent. Mag. v. p. 375; *canadensis* Lec., Proc. Acad. 1855. p. 275.

This species is usually known under the latter name and credited to Latreille. The latter author never named the species, and the first mention of the name is in Encyc. Meth. Ins. x, p. 261, where there is also no description. To Newman we owe the first description —brief, but sufficient.

The thorax, scutellum, underside of body and legs are rufotestaceous, the rest of the body piceous. Thorax sparsely punctate. Elytra moderately coarsely and closely punctate, the surface with short, semi-erect brown hair. Length .32—.55 inch; 8—14 mm.

The males are always smaller and have a narrower and less coarsely punctured thorax. The fifth ventral is broadly, but not deeply emarginate, the sixth, usually visible, feebly emarginate. In the females the fifth segment is broadly obtuse, the sixth not visible. The eyes are large and contiguous on the front as in all the species of the genus, while the female eyes are moderately separated.

Occurs from Canada to Florida and westward beyond the Mississippi River.

D. picipes Horn, Trans. Am. Ent. Soc. 1880, p. 154.

This species is almost entirely piceous, the scutellum, pro- and mesothorax, femora at base and anterior coxæ rufotestaceous. The thorax is smooth, as in the following species, the elytral sculpture denser and coarser than in *bicolor*, which it otherwise resembles. Length .42—.51 inch; 11—13 mm.

In the male the fifth ventral segment is truncate, the sixth feebly notched at middle.

Occurs in Washington Territory and northern California.

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D. concolor Newm., Ent. Mag. v, p. 375; Lec., loc. cit.

Entirely pale yellowish testaceous. Thorax distinctly longer than wide in both sexes, surface smooth, the median longitudinal impression visible at base only. Length .35—.50 inch; 9—13 mm.

The fifth ventral of the male is broadly truncate, the sixth feebly notched. The fifth of male is broadly rounded.

Occurs in Canada and the northern portions of the adjacent States.

D. ephemeroides Mann. (*Pogonocerus*), Bull. Mosc. 1852, p. 348; *testaceus* Lec., Proc. Acad. 1855, p. 275.

This species is very like the preceding in form, color and sculpture. The thorax in both sexes is not longer than wide, and the median line is more or less impressed in its entire length. Length .50—.56 inch; 12.5—14 mm.

The ventral sexual characters are the same as in *concolor*.

Occurs from Canada to Washington Territory and Vancouver and to Alaska.

Pyrochroa fusicollis Mann., Bull. Mosc. 1854, iv, p. 301; Motsch. Schrenks Reise, p. 143.

Mr. Otto Lugger, of Baltimore, has given me two ♀ specimens of this species collected in Alaska. It was originally described from Kamtschatka, so that its occurrence in Alaska is possible.

DESCRIPTION OF PLATE III.

Fig. 1. Larva of *Glyptus sculptilis* as seen from above.
Fig. 2. The same, lateral view. Fig. 3. Head as seen from the side.
Fig. 4. Clypeus, mandible and antenna.
Fig. 5. Mentum and maxilla. Fig. 6. Mandible seen from beneath.
Fig. 7. Leg of *Glyptus* larva.
Fig. 8. Larva of *Polyphylla decemlineata* natural size.
Fig. 9. Head seen from above. Fig. 10. Head, lateral view.
Fig. 12. Maxilla, seen from beneath.
Fig. 13. Mentum, the lower side. Fig. 14. Mentum, the inner side.
Fig. 15. Anterior leg. Fig. 16. Posterior leg.
Fig. 17. Larva of *Platypsylla castoris*, upper view, magnified fifty diameters.
Fig. 18. View of underside.
Fig. 19. Underside of head, with mouth parts.
Fig. 20. Antenna of left side, seen from beneath.
Fig. 21. Front leg. Fig. 22. Posterior leg.
Fig. 23. Mouth parts of *Ægialites debilis*; *a*, mentum and ligula; *b*, maxilla; *c*, mandible from beneath; *d*, mandible, upper side.
Fig. 24. Mouth parts of *Othnius lugubris*; *a*, maxilla; *b*, mentum, ligula and palpi of ♂; *c*, mandible.
Fig. 25. *Anillus explanatus* Horn.
Fig. 26. *Trimitomerus Riversii* Horn.

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A MONOGRAPH OF THE SPHINGIDÆ of America North of Mexico.

BY JOHN B. SMITH.

Early in 1885 I gave a short paper on the genera of the N. A. *Sphingidæ*, as one of a series of introductory papers published in "Entomologica Americana." In this considerable changes were made from the classification usually accepted by American authors and quite a number of genera merged. The paper called forth a criticism from Prof. Fernald, who was working on the New England forms of the same family, as a whole appreciative in tone, but disagreeing in the fusion of some of the genera, and calling attention to some few inaccuracies which had crept in, mainly the result of a loose use of language. Prof. Fernald suggests, from the result of his studies, that a study of more species would probably modify my opinions in the direction of further generic division. The professor was right; since that time I have lost no opportunity of adding to my notes, which formed a goodly number of pages before this paper was begun. I have seen nearly every species, and of most I have made thorough study—in an isolated way it is true, and at odd times, as I saw the species, but sufficient to enable me to complete the work at this time with the U. S. National Museum collection (now including my own) which represents the great majority of all the species, except in the *Macroglossinæ*, in which it is comparatively poor.

I have drawn liberally for my descriptions on Prof. Fernald's work, and have freely reproduced the original descriptions of larvæ and imagos where they were sufficiently full, in all cases, however, comparing them with the insects themselves where possible. Prof. Riley has very kindly placed at my disposal all his notes in the family, and I have made use of them in many cases to solve doubts, without special acknowledgement. There is hardly a collector or collection that has not in some way contributed or aided in this paper at odd times and often unknown to himself, and all have my sincere thanks.

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In the present paper I have changed, considerably, my views as given in the synopsis above cited, and in the direction suggested by Prof. Fernald. I have no apology to offer for this, since the principal changes are the result, less of corrected observation, than of the advisability of adopting generic terms for certain fairly well marked divisions or sections of the genus *Sphinx*. The genera adopted in the *Sphingidæ* are very largely opinionative. It rests merely on individual opinion as to what value is to be given them—whether we will with Boisduval have a large genus with numerous sections, or with Butler have small, compact genera, each name expressing a definite idea, less of structure than of appearance or habitus. I have adopted the latter view in this paper, though I have not carried it to the extent of some of the recent authors. From the other point of view the subfamily *Sphingidæ* would contain only the genera *Argeus*, *Dilophonota*, *Sphinx*, *Cautethia* and *Ellema*, the genera *Ceratomia*, *Daremma*, *Protoparce*, *Diludia*, *Hyloicus* and *Dolba*, being comprised under the generic term *Sphinx*. The assemblage thus constituted is unwieldy, and the generic term loses definiteness. The smaller genera are susceptible of sufficiently accurate definition to enable them to be readily recognized.

The family *Sphingidæ*, as here treated, corresponds with the *Sphinx legitimæ* of Linnaeus, and the family characteristics are as follows:

Body robust, yet generally graceful; abdomen long, conic, usually cylindric, rarely depressed, often tufted at the sides and at tip. Head usually large, rarely retracted; eyes often prominent, naked, sometimes lashed, never hairy. Palpi usually well developed, never abnormally so, reaching the middle of front, its clothing often forming a short, conic, obtuse snout. Tongue usually long and strong, often much exceeding the length of the insect itself, sometimes obsolete. The thorax is robust, oval, convex, rarely somewhat depressed, often considerably produced in front of the base of primaries. The antennæ are peculiar; they are prismatic, the joints, as a rule, with hexagonal sides, the top and bottom flat; sometimes they are almost clavate, with an abrupt little hook at tip; more usually, in the typical genera they are thickest in the middle with a similar tip; quite commonly they are fusiform, the terminal hook long and gradual, usually recurved, but often simply curved. The wings are usually comparatively small and narrow, the primaries with usually acute apices and oblique outer margin, the inner margin always much shorter than the costal, outer margin sometimes angulated and dentate.

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The venation is distinctive. The primaries may have eleven or twelve veins; vein one, the dorsal, submedian, or internal vein (submedian nervure) runs from root to the internal angle, and is furcate at base. The discal cell is usually very short and narrow, rarely more than one-third the length of costa. From the median vein, forming the lower margin of cell, two (medio posterior nervule), is given off usually basad the middle; vein three (medio central nervule) starts from the same vein nearer its end; vein four (medio superior nervule) runs from the end of the median to usually about the middle of the outer margin. The cross vein closing the cell (discal nervure) is usually oblique, and from it near its middle, though usually nearer to four than six, vein five (disco central nervule) runs to the outer margin. The subcostal is usually close to the costa and gives off at its outer third, vein eleven (first subcosto marginal nervule); half way from this point to the tip arises vein nine (third subcosto marginal nervule), which may or may not branch near its termination in costa; according as it branches or not, the wing has either eleven or twelve veins; it is an inconstant factor, varying in the same species; usually it is not branched. From the end of the subcostal arise six and eight; the latter (subcosto apical nervule) to the apex, giving off seven basad the middle (subcosto postapical nervule) to the outer margin; six (subcosto inferior nervule runs to the margin. Vein twelve, the costal vein runs to the costa, free from base at a variable distance therefrom.

The secondaries have two internal veins, 1 *a* and 1 *b* (internal and submedian). The cell is usually short and small here also; it gives rise to two, three and four (medio posterior, m. central and m. superior nervules), the latter from the end. The cross vein is oblique, giving rise to five (disco central nervule) at about its middle; veins six and seven (subcosto postapical and s. c. apical) from the end of the subcostal, or on a short stalk from that point; vein eight (costal vein) free from costa to the costal margin above the apex; it is connected near base with the subcostal vein by a short branch (intercostal nervure). This venation is typical of the family and thoroughly constant in all its modifications.

Throughout this paper I have followed the European (Continental) practice of indicating the veins by numbers rather than names. This has been recently objected to by Dr. Packard, as unscientific, but I prefer to be unscientific until some nomenclature is generally agreed upon. At all events it seems much more simple to refer to

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vein seven, than to the "subcosto postapical nervule," and where the number of veins is so uniform and the relative position of the veins so constant as it is throughout the Lepidoptera, the numeric system has decided advantages over the other in simplicity.

I cannot see the advantages either in speaking of nervules and nervures, making those veins reaching the base *nervures*, while those which do not reach the base are *nervules*.

Clemens' names for the veins are given above; his names for the interspaces are as follows:

Apical, between 7 and 8; postapical, between 6 and 7; disco-central, between 5 and 6; medio superior, between 4 and 5; medio central, between 3 and 4; medio posterior, between 2 and 3; submedian, between 1 and 2; internal, below vein 1.

The legs are variable in length, strength and armature, both as to spinulation and the ordinary spines of middle and hind tibiæ.

The genitalia are of a peculiar type, so far as I am aware not found with any constancy in any other group of the order The supra-anal plate and the normal supra-anal hook of the Heterocera is here modified into a structure that may be roughly compared to one of the great claws of a lobster. There is a decided tendency in the genus *Hemaris* to a division of the supra-anal hook, which in *Dilophonota* and *Argeus* is completed, the hooks being separated somewhat as in some of the *Saturniidæ*, while here the plate in one of the genera, at least, is double.

I have been able to examine the genitalia in most of the species here treated, and have given figures of the supra-anal plates and side pieces. In addition there are one or two other variable structures, as the penis sheaths, which I have not been able to examine carefully, and which may in future afford characters of value.

The habits of the imago are diurnal or crepuscular, some species flying in the hottest sunshine, others and the great majority of the species in the early evening, in the twilight and just at dusk; a few fly to light or come to sugar, while in the *Smerinthinæ* the species are rarely taken, except at light. Their habits are thoroughly *Bombyciform*.

The larva of the *Sphingidæ* are as readily distinguished as are the imagos. They are usually large in size, solitary feeders as a rule, green in color in the majority of instances, often with oblique lateral stripes; generally they are furnished with a prominent caudal horn, in some few forms lost in the latter stages and then replaced by a shining lenticular tubercle.

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At rest they often have a habit of elevating the head and thoracic segments, and somewhat curving them in sigmoidal shape, and it is supposed that this habit, giving them a fancied resemblance to the Egyptian Sphinx, prompted the name.

According to Lintner the larvæ of most Sphinges have eight oblique folds or wrinkles to each segment which he calls annulets, and uses the term very often in the larval descriptions.

Concerning the larva of the *Sphingidæ* Boisduval says they are smooth, cylindrical, elongated, slightly swollen posteriorly, generally furnished with a horn on the penultimate segment, or sometimes with a little lenticular shield in place of the horn. They live solitarily on trees, shrubs or low plants.

The SMERINTHIDES have larvæ with habits and with the horn of the eleventh segment as in the other *Sphingidæ*, and are particularly distinguished by having, in most instances, the head triangular and the skin shagreened or rugose.

The EURYGLOTTIDES have larvæ with rounded head and smooth, never shagreened skin. There is usually a horn to the eleventh segment, and in most cases a series of oblique lateral stripes.

The DEILEPHILIDES have smooth larvæ with globular head, are often rather brightly colored and marked with ocellate spots. Some of them, which might almost constitute a tribe by themselves, have the first three rings more slender than the rest and retractile. Some have a horn on the eleventh segment; others, forming the exception, a little wart-like plate. In some others again the horn exists only in the earliest stages and disappears completely in the adult.

The MACROGLOSSIDES have larvæ which are generally green, more or less rugose dotted, even sometimes a little shagreened. They are attenuated anteriorly, and the head is globose. Usually with a more or less developed straight or curved horn the eleventh segment. Some have longitudinal lines, others oblique lines as well, while some have ferruginous lateral spots.

When full grown they either pupate above ground between leaves in a slight cocoon, or go deep under ground and pupate in a cell.

The pupæ are variable in shape and will be more closely described with the species. Prof. Riley has described a peculiarity of pupal structure in *Ceratomia catalpæ*, which will be quoted under that species. He says it is found in a modified form in some other species, and he intends to make a close study of the structure throughout the family.

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According to Mr. Lintner the sexes of Sphinges may be determined in the pupa state by the following characters, which are, however, not equally developed:

♂.—Eleventh segment inferiorly similar to the preceding, and its posterior incision is not interrupted and rectilinear. On the twelfth segment, occupying its full length, are two prominent elongated granulations, divided by a deeply impressed line. Posterior to this is the anal plate, having a central sulcus, with prominent margins, with a suboval, smooth, depressed spot; this is similar in both sexes.

♀.—Eleventh segment inferiorly marked with an impressed medial line, on each side of which, near the middle of the segment, is a suboval, smooth spot, through which the impressed medial line is continued; the intermediate incisure is interrupted by the smooth spot, and, in some species, is bent in an angle directed anteriorly.

It may be interesting to give a brief review of the principal classifications heretofore proposed, which will supplement the rather brief characterization given by me.

The genus *Sphinx* was created by Linnaeus, in 1758, in the "Systema Naturæ," and defined as follows:

"*Sphinx.—Antennæ medio crassiores f. utraque extremitate attenuatæ, subprismaticæ. Alæ deflexæ (volatu graviore vespertino f. matutino).*

This genus he divides into four groups as follows:

LEGITIMÆ *alis angulatis.*

" *alis integris, ano simplici.*

" *alis integris ano barbato.*

ADSCITÆ *habitu et larva diversæ.*

In that general term *Sphinx* were included all the forms known to Linnaeus belonging to the present families *Sphingidæ, Sesiidæ* and *Zygænidæ*. The first and second divisions associate tolerably congruous species; the third contains a mixture of *Sphingidæ* and *Sesiidæ*, while the fourth has nothing to hold it together save that the species do not belong to either of the foregoing divisions.

No changes were made by Linné in this classification in his subsequent writings.

Fabricius, in 1775, in the "Systema Entomologiæ" divides the insects into eight classes, corresponding practically to the Linnaean orders, but with different names. The Lepidoptera are here the Glossata (*Os palpis linguaque spiralis*). The Linnaean generic terms and divisions are retained and somewhat elaborated, while several new terms are proposed.

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The genus SPHINX is here defined as follows: *Palpi duo reflexi, pilosi. Lingua spiralis plerisque exserta. Antennæ squammatæ.*"

The genus is headed by *ocellata*, followed by *lugubris*, then the other European *Smerinthids* and then the other Sphinges in no particular order. The Linnaean idea of dentate and non-dentate wings seems to have controlled the arrangement.

On page 547 of the same work he creates his genus SESIA, defining it as follows: "*Palpi reflexi. Lingua exserta, truncata antennæ cylindricæ, extrorsum crassiores.*"

The first species is our *tantalus*, then *hylas*, of China, then *stellatarum*, of Europe, then the clear wings, *thysbe* and *fuciformis*. These are all allied, at least in some respects, but the following species are those later termed by him *Ægeria*.

Zygæna is defined on page 550 as having: "*Palpi reflexi. Lingua exserta setacea. Antennæ sæpius medio crassiores.*"

Z. pholus is the only American representative. In the other, subsequent published works of this author, no changes are made in this group, save that new species are added, described since the preceding period of publication.

In 1777, Scopoli proposed the genus *Macroglossa* for the European *stellatarum* and allies.

In 1801 Laspeyres, in his "*Sesiæ Europæ Iconibus et Descriptionibus illustratæ*," excludes from the genus *Sesia* all those species not allied to *tipuliformis*.

In 1805, Latreille, in the Histoire Nat. des Crust. et Ins. vol. xiv, calls his second family SPHINGIDES, divided as follows:

Sphinx.—Antennæ thickened to a prismatic club, with a simple thread at tip; tongue present.

Atropos, ligustri, convolvuli, elpenor, euphorbiæ, œnotheræ, stellatarum, fuciformis, bombyliformis.

Smerinthus.—Antennæ prismatic, pectinate or serrate, hooked at tip; tongue very short, or nearly wanting.

S. tiliæ, ocellata, populi, quercus.

Sesia.—Antennæ spindle shaped, a little incurved, at tip with a little scaly tuft; palpi nearly clavate, second joint stouter, clothed with hair or scales.

S. apiformis, tipuliformis, culiciformis.

Zygæna.—Antennæ spindle shaped, often curved, without scaly tuft. Palpi nearly clavate, the second joint not more strongly clothed with hair than the others; tongue present.

Z. filipendulæ, loti, scabiosæ, staticis, etc.

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Stygia.—Antennæ cylindric-clavate, curved, without scaly tuft at tip; beneath with a double row of lamellæ or teeth. Palpi clavate. Tongue wanting or very short.

Stygia australis from southern France.

Laspeyres' restriction of the term *Sesia* is followed, and the species not congeneric with *apiformis* are replaced in *Sphinx*, Scopoli's genus being evidently overlooked, since it is not mentioned at all. In the Gen. Crust. et Ins. it is used though Latreille considers it not generically different from *Sphinx*. No other changes were made by Latreille from this classification.

In 1807, in the sixth volume of Illiger's Magazine, p. 279–289, appears an extract from "*Fabricii Systema Glossatorum.*" The author of the translation says: "Bei dem Interesse, dass dieser Gegenstand gerade gegenwartig hat, benutze ich die günstige Gelegenheit, diese Gattungen zur Erkenntniss des entomologischen Publikums zu bungen, da der eriste Band jenes *Systema Glossatorum* vor Ostern nicht ersheinen kann."

As a matter of fact the work was never published, and the Fabrician genera rest on this extract, which embraces the Rhopalocera, and the Heterocera to the *Zygænidæ*.

The following is a translation of the paper so far as the Heterocera are concerned:

Laothoe—Palpi two, rough, very obtuse, two-jointed. Tongue very short, membranous, almost indistinct. Antennæ setaceous; joints scaly beneath.

Types—*Sph. ocellata, quercus, tibiæ, populi*, etc.

This genus is therefore perfectly synonymous with the Latreillian genus *Smerinthus*.

Sphinx.—Palpi thick, rough, very obtuse, two-jointed. Antennæ setaceous; joints beneath scaly.

Wings dentate.

Sph. ello, tetrio.

Wings entire.

Sph. nerii, atropos, euphorbiæ, ligustri, et al.

Sesia: Palpi two, short, thick, rough, obtuse, two-jointed. Antennæ thicker outwardly, with a small hook at tip.

Wings scalloped.

Sp. œnothera.

Wings entire.

S. stellatarum, fuciformis, etc.

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ÆGERIA: Palpi two, projected forward, three-jointed, second joint further from the head, third joint shorter, clavate, pointed. Antennæ cylindrical, many jointed. Terminal joint longer, finer, pointed.

Æ. apiformis, ichneumoniformis, vespiformis, etc.

AMATA: Mouth with projecting flattened tuft covering the base of the tongue. Palpi very short, single jointed. Antennæ filiform.

A. passalis, cerbera.

ZYGÆNA: Palpi two-jointed; second joint longer, hairy outwardly. Abdomen thicker in the middle.

Z. filipendulæ, scabrosa, quercus, etc.

GLAUCOPIS: Palpi long, recurved, three-jointed; second joint longer, outwardly hairy; third compressed, naked. Antennæ filiform, pectinated.

G. argynnis, pugione, halterata, infausta, etc.

PROCRIS: Palpi two, slender, recurved, three-jointed, joints subequal. Antennæ cylindrical.

P. staticis, pruni, etc.

This seems to be as far as the first volume carried the classification, at all events the article in question leaves that impression. On a subsequent page the systems of Schrank and Latreille are compared with the Fabrician scheme, principally in the *Rhopalocera*.

The term *Sesia* is here used to express the idea fixed by Scopoli for *Macroglossa*, while *Ægeria* is perfectly synonymous with *Sesia*, as that term is restricted by Laspeyres and Latreille.

Latreille, in 1809, used Scopoli's term *Macroglossa*, considering it, however, not sufficiently distinct from *Sphinx*. In that year, too, he divides the Lepidoptera into Diurna, Crepuscularia and Nocturna. The Crepusculaires form two families: *Sphingides*, with prismatic antennæ, tufted at tip, and *Zygænides*, with fusiform antennæ, not tufted at tip.

The Sphingides here include the genera *Castnia* (antennæ clavate), *Smerinthus*, *Sphinx* and *Macroglossum*. The *Zygænidæ* are here for the first time excluded from the *Sphingidæ*, while they are retained in the same group.

Ochsenheimer, in the second volume of the "Schmetterlinge Europa's" uses the term *Sphinx* in its widest sense, including *Macroglossa* and *Smerinthus* under the same term. *Sesia* is used in the

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Latreillan sense, and the extract of the Systema Glossatorum in "Illiger's Magazine" is referred to and again abstracted.

In the fourth volume of the same work, issued in 1816, he gives a new scheme of classification, which, so far as the present family is concerned, resulted in the adoption of the genera *Macroglossa*, *Deilephila*, *Sphinx*, *Acherontia* and *Smerinthus*.

In the same year Dalman, in the "Vetensk. Akad. Handl.," proposed the genus *Hemaris* for the European clear winged species *fuciformis* and *bombyliformis*, a genus, by-the-bye, which has met with but scant recognition in Europe.

Dated the same year, but as to the Sphingidæ certainly not issued before 1818, is Jacob Hübner's Verzeichniss bekannter Schmetterlinge. This is the first time since Fabricius, that an undertaking was made to bring together all the described species of the order and to propose a consistent general classification. It may be of interest, too, in this connection to remark that the journals of that period inveighed fiercely against "the modern" tendency to create genera on insufficient characters, and there were lumpers and splitters in those days as there are at present. In view of this loudly expressed tendency it certainly required an extraordinary man to calmly ignore the feeling of his age and bring out a classification which, for minuteness of division and subdivision, is rivalled only by Mr. Scudder's modern classification of the *Nymphalidæ* and *Hesperidæ*. The result was that the work was utterly disregarded by Hübner's contemporaries, Stephens first bringing portions of it into use, and by reprinting a portion of it, bringing it to the knowledge of English students.

The SPHINGES form Hübner's second Phalanx, defined as follows:

Mouth and tongue prolonged and spiral, the palpi rather closely appressed, the antennæ lamellate. Primaries long and narrow, the secondaries short and broad. Abdomen long and stout.

In this Phalanx the first tribe is the *Papilionides*, with the tongue moderate, the antennæ thickened toward tip, palpi small and pointed. The first stirps is *Zygænæ*, containing no N. A. species.

Stirps II, *Chrysaores*, contains in Family A, *Procris*, here applied to *Ino statices*; in Family B, *Syntomis*; both used in our fauna, but in the case of *Procris* in an entirely different sense.

Stirps III, *Glaucopes*, and Stirps IV, *Sphecomorphæ* contain no American genera.

The second tribe is termed *Hymenopterides*, with the palpi curved upwards, hairy; the antennæ hardly pectinated. Wings partly bare of scales. Abdomen with a brush-like tuft at tip.

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Stirps I, SESIÆ, has the primaries long and narrow, the secondaries short and broad, both rather lengthily fringed.

Familia A, *Corpulentæ* has the body rather thick, the wings not very narrow, and contains the single coitus *Sphecia*, to which *apiformis* is referred as one of the species.

Familia B, *Graciles*, has the body rather thin and the primaries very narrow. It contains five coiti, viz.:

Paranthrene, with primaries closely scaled, the abdomen unequally ringed with yellow.

Melittia, with primaries partly, secondaries entirely transparent, the feet with large hairy tufts.

Bembecia, with both wings transparent, abdomen with fan-like tufts at tip. The common *tipuliformis* is typical.

Synanthedon, with primaries maculate with red in centre and outer margin.

Conopia, with the abdomen banded with bright red.

Stirps II, APYRALIDES, has the wings rather broad and angulate, and also dentate.

Familia A, *Vitratæ*, has the wings with transparent spots; the abdomen smooth.

It contains two coiti: *Thyris*, with but a single row of pale spots, abdomen white ringed (*T. fenestrina* sole species) and *Phostria*, which has two rows of clouded spots on primaries, the abdomen concolorous.

The third tribe contains the *Legitimæ*, and as it is with this that we have more particularly to do, the whole is reproduced, the species only being cited which are either North American, or necessary to give an idea of the composition of the coitus. The Verzeichniss has left its mark on the present arrangement of the American species, and Mr. Grote has used most of the terms in some one of his many lists to abandon them for others in subsequent ones.

LEGITIMÆ.

Palpi thick, obtuse, the antennæ broadening anteriorly, shortly lamellate, at the tip almost recurved, the body thick, the wings strong.

Stirps I.—BOMBYLIÆ.

The tongue very long, the antennæ nearly clavate and pointed at the tip, body tufted.

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Familia A.—*Vulgares.*

The wings rather short, entire, the abdomen tufted at the sides and tip.

Coitus 1.—CEPHANODÆ.

Wings nearly scaleless, the abdomen variegated.

Cephanodes hylas, bombyliformis, fuciformis, pelasgus, croatica.

Coitus 2.—ÆLLOPODES.

The primaries with transparent white lines, the secondaries dilated.

Ællopos titan, fadus.

Coitus 3.—PSITHYRI.

The primaries banded with black and gray, the secondaries rusty yellow and blackish, the anal tuft spotted.

Psithyros stellatarum, belis, ceculus, faro.

Familia B.—*Æquivocæ.*

The wings dilated, and dentate or angulate, the body tufted at tip only.

Coitus 1.—PROSERPINI.

The dorsum of thorax neat; the primaries darkly banded and streaked with whitish.

Proserpinus œnotheræ, gauræ, gorgoniades.

Coitus 2.—ENYONES.

Primaries almost hooked at tip, pale and darkly marked.

Enyo japyx, camertus, danum, phegeus, etc., congeneric.

Coitus 3.—HEMEROPLANÆ.

Primaries obtuse at apex, mottled, and with a pale mark in median space.

Hemeroplanes pan, triptolemus, plutotonius, oiclus.

Coitus 4.—AMBLYPTERI.

Primaries rounded at tip; median space brilliantly colored.

Amblypterus ganascus, panopus, bubastus.

Coitus 5.—NEPHELÆ.

Primaries clouded and banded, secondaries dark.

Nephele morpheus, didyma, chyron.

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Stirps II.—EUMORPHÆ.

The antennæ rather thin and long, recurved at tip, abdomen long, acute at tip, entirely smooth.

Familia A.—*Elegantes.*

Head, body and abdomen not entirely immaculate; wings above, brightly colored.

Coitus 1.—PHOLI.

Primaries brownish-gray; secondaries prettily colored, both with brownish shades and angulated black spots.

Pholus crantor, licaon, strigilis, ficus.

Coitus 2.—DAPHNIDES.

Primaries principally green, softly and brightly spotted.

Daphnis megœacus, hippothous, nerii.

Coitus 3.—ARGEI.

Primaries green, marked with pale lines; secondaries brightly colored.

Argeus labruscæ, pandion.

Familia B.—*Obliquostriatæ.*

Primaries outwardly striate, with pale and dark streaks from the middle of inner margin to apex.

Coitus 1.—AMPHIONES.

Primaries dark reddish-gray, clouded, spottedly streaked; secondaries red.

Amphion nessus, brennus.

Coitus 2.—THERETRÆ.

Both wings outwardly with angulated lines; secondaries shaded with yellow and black.

Theretra equestris, nechus, porcellus, tersa.

Coitus 3.—HIPPOTIONES.

Primaries outwardly with oblique white bands and brown stripes, and with white veins; secondaries softly red spotted.

Hippotion celerio.

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Coitus 4.—Isoplæ.

Primaries brown, outwardly obliquely banded with pale and dark; secondaries red.

Isoples eson, alecto, neoptolemus, theylia.

Coitus 5.—Xylophanæ.

Primaries obliquely marked with ligneous streaks; secondaries blackish shaded.

Xylophanes anubus, lycetus, gortys, cajus, drancus.

Coitus 6.—Orei.

Primaries alternately with colored stripes; secondaries with black and colored bands.

Oreus gnoma, acteus, elpenor, amadis, licastus.

Stirps III.—DEILEPHILÆ.

Antennæ somewhat thicker outwardly; primaries with oblique shaded bands.

Familia A.—*Pallidivenosæ.*

Primaries spotted and streaked with brown shades; secondaries black, with red bands; abdomen black at sides.

Coitus 1.—Dupones.

Primaries with longitudinal as well as transverse bands, and with veins pale; secondaries pale gray and rosy-red.

Dupo vitis, jussieuæ.

Coitus 2.—Phryxi.

Primaries almost entirely pale veined; abdomen, at sides and top, black and white checkered.

Phryxus livornica, caicus.*

Familia B.—*Populares.*

Primaries with transverse dusky bands; secondaries red in the middle.

Coitus 1.—Hylæ.

Primaries with dark shades along costal margin; abdomen checkered at sides with white and black.

Hyles galii, zygophyllii, euphorbiæ, et al.

* To this *lineata* and *daucus* are cited as synonyms.

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Coitus 2.--THAUMÆ.

Primaries indistinctly spotted and streaked; abdomen sparsely checkered.

Thaumas vespertilio, capensis, cecrops.

Coitus 3.—CHROMES.

Primaries with angulated broken bands; secondaries yellow, with black margin.

Chromis erotus.

Coitus 4.—CLANES.

Wings rather broad, dull in color, with black transverse streaks.

Clanis nicobarensis, phalaris, achemenides.

Stirps IV.—MANDUCÆ.

All organs rather well developed; tongue strong; eyes large; wings streaked; body colored.

Familia A.—*Læves.*

Tongue long; all parts rather slender.

Coitus 1.—HYLOICI.

Entirely whitish-gray, with black maculation; primaries straightly and wavily streaked; secondaries with blackish shades.

Hyloicus pinastri, coniferarum, hylæus, hasdrubel, etc.

Coitus 2.—ERINNYES.

Primaries blackish-gray, with dentate black streaks; secondaries rusty, with black margin.

Erinnyis ello, œnotrus, scyron, alope, caricæ.

Familia B.—*Ponderosæ.*

All parts rather thick and short, neatly maculate.

Coitus 1.—ACHERONTIÆ.

Tongue very short; antennæ at tip with a small brush; body with larviform maculation; fringes short.

Acherontia atropos, chionanthi, morta.

Coitus 2.—COCYTII.

Tongue long; body almost immaculate; abdomen one-half yellow spotted.

Cocytius jatrophæ, rustica, forestan.

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Coitus 3.—PHLEGETHONTIUS.

Thorax immaculate, but the body ornamented with yellow spots.
Phlegethontius cluentius, lucetius, hannibal, carolina, paphus.

Coitus 4.—AGRII.

Secondaries and abdomen banded with red and black.
Agrius anchemolus, convulvuli, cingulatus.

Coitus 5.—LETHIÆ.

Primaries outwardly dentato-strigose; secondaries banded.
Lethia, ligustri, prini, drupiferarum, kalmiæ, gordius.

Stirps V.—SMERINTHI.

Head small, almost concealed; tongue short and very weak; palpi short; antennæ bent; wings with margins dentate; the legs thick, with concolorous vestiture.

Familia A.—*Dentati.*

Body immaculate; wings angulate, or dentate.

Coitus 1.—COLACES.

Primaries with a single angle; with shining median macula; secondaries pale.
Colax apulus.

Coitus 2.—POLYPTYCHI.

Wings scalloped, or dentate; with shaded bands and black stripes.
Polyptychus dentatus, tomesius, juglandis, populi, quercus.

Familia B.—*Angulati.*

Thorax maculate; primaries obtusely angulated, with softly shaded maculation.

Coitus 1.—PAONIÆ.

Secondaries with an ocellus above.
Paonias salicis, ocellata, myops, excæcatus.

Coitus 2.—MIMANTES.

Palpi rather moderate; primaries deeply excavate and obtusely angulate; with banded maculation.
Mimas tiliæ.

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Familia C.— *Uncinati.*

Primaries beak-like; secondaries sharply angulated.

Coitus 1.—Oti.

Primaries with shaded bands; secondaries dusky at anal angle.
Otus chœrilus, myron.

———o———

It will be noticed, at once, that only the most superficial color characters are used for the majority of the divisions, and that species now considered generically identical, are often widely separated. For instance, the genus *Phlegethontius* Hb., as used in Grote's List, contains four species. In the Verzeichniss one of these is an *Acherontia*, the same species under one of its synonyms is also a *Cocytius*, a second species is a *Phlegethontius*, a third an *Agrius*, while the fourth is here omitted, but later on also described as a *Phlegethontius.*

It is apparent, also, that Hübner did not bother himself in the least about genera created by previous authors. Some terms like *Deilephilæ*, *Smerinthi* and *Sesiæ*, are used to designate Tribes, but the genera *Sphinx*, *Smerinthus*, *Deilephila* and *Sesia*, have disappeared.

In every family, in every group, the question of how far the coiti names are to be recognized, comes up as a puzzle to the student. Whether to follow Boisduval and other European authors, and ignore the work as without value, or, like Mr. Grote, to use it as a sort of Alkoran, all the terms of which must in some way be brought into use, whether it displaces other subsequent and more conscientious describers or not. There certainly seems no reason why many of the terms referring to correctly associated species should not be used, but on the other hand, as Hübner did not consider himself bound in any way to recognize the genera of his predecessors, he cannot complain (or his champions for him) that subsequent authors have treated his illy-constructed coiti in the same way.

In Stephens' Illustrations of British Ent. Haust. 1, 1828, the division *Crepuscularia* is divided into *Zygœnidæ*, *Sphingidæ*, *Sesiidæ* and *Ægeriidæ*. The Sphingidæ are divided among four genera as follows:

Wings more or less angulated..... **Smerinthus.**
Wings entire, acute.
Maxillæ short..... **Acherontia.**
Maxillæ long.
Antennæ scarcely clavate..... **Sphinx.**
Antennæ distinctly clavate..... **Deilephila**

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The term *Sesiidæ* is here used for the genera *Macroglossa* and *Sesia*, the latter term being used in a manner synonymous with *Hemaris* Dalm., which is not mentioned.

The *Ægeriidæ* are synonymous with the *Sesiidæ* of Continental authors, and two genera are recognized:

Maxillæ short; antennæ abbreviated..... .....**Trochilium.**
Maxillæ long; antennæ longer ....**Ægeria.**

Stephens' example in this misuse of the term *Sesia*, or rather his failure to recognize the restriction of the term by previous authors, has been followed by British entomologists to the present day, and American entomologists have, until recently, followed in their wake.

In the thirty-sixth volume of the "American Journal of Science and Art," (Silliman's journal) 1839, Dr. T. W. Harris gives the first review of the American species of the Linnaean genus *Sphinx* in its widest sense, recognizing the families now generally adopted, and including the species loosely classed as *Zygænidæ*. He begins his paper with a definition of the group, and of the habits of the larvæ and imagos, then follows a "Synopsis of Families and Genera." He divides the *Sphinges* into two tribes, according to the Linnaean system, and as follows:

Tribe I.—SPHINGES LEGITIMÆ.

Larvæ colored, for the most part horned on the tail, and feeding on the leaves of plants; or whitish, slightly hairy, not horned, and living on woody material within the stems of plants. Antennæ of the winged insects tipped with a minute bristly tuft [Note.—Obsolete or wanting in the *Smerinthini*]. Palpi (except in the *Ægeriidæ*) with the third joint minute and indistinct.

Tribe II.—SPHINGES ADSCITÆ.

Larvæ always colored, more or less hairy, never horned, feeding on leaves and transforming in a silken cocoon, which is fastened to the plants on which they live. Antennæ of the winged insects not tufted at the end. Palpi distinctly three-jointed.

The *Sphinges legitimæ* he divides into three families: *Sphingidæ*, *Macroglossidæ* and *Ægeriidæ*.

The *Sphingidæ* he limits as follows:

"Antennæ fusiform and prismatic, ending in a hook, and in the males transversely biciliated beneath, or more rarely curved, and in the females bipectinated beneath. Palpi pressed close to the face,

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short, thick and obtuse, with the third joint minute and concealed. Body thick; abdomen conical and not tufted at the end. Flight crepuscular. Larvæ colored, naked, with a caudal horn, which is sometimes obsolete and replaced by a callous spot; they devour the leaves of plants and go deep into the earth to transform, or conceal themselves upon the surface under leaves in an imperfect cocoon."

Six genera are here included, those newly created being indicated by a *—*Smerinthus*, *Ceratomia**, *Sphinx*, *Philampelus**, *Deilephila*.

It will be observed that here the Smerinthini or nearest allies of the *Bombycidæ* are placed at the head of the series, running to *Deilephila* as the most natural grading into the *Macroglossidæ*. Harris did not appear to know Hübner's work, and, in fact, his supply of literature, except from English sources, appears to have been extremely limited.

The *Macroglossidæ* are defined as follows:

"Antennæ fusiform, prismatic, ending with a hook, and transversely biciliated beneath in the males. Palpi pressed close to the face, with the third joint minute and concealed, short, thick and obtuse at the end in some, slightly elongated and subacute in others. Body short and thick, or flattened a little; abdomen tufted at the end. Flight diurnal. Larvæ colored, naked, with a caudal horn, which is sometimes obsolete and replaced by a callous spot; they devour the leaves of plants and enter the earth to transform, or conceal themselves upon the surface in an imperfect cocoon under leaves."

Three genera are placed in this family, viz.: *Pterogon*, *Thyreus* and *Sesia*.

The *Ægeriidæ* follow next in order, and are elaborately defined; but with them we have nothing to do at present, save to state that three genera are placed in the family, viz.: *Trochilium*, *Ægeria* and *Thyris*.

The English entomologists are followed in the use of the terms *Sesia* and *Ægeria*.

In the second tribe, "SPHINGES ADSCITÆ," three families are recognized: *Agaristidæ*, with *Alypia* as only genus; *Zygænidæ* with a single (new) West Indian genus *Mastigocera* and *Glaucopididæ* with the genera *Glaucopis*, *Syntomeida*, *Cosmosoma*, *Lycomorpha*, *Ctenucha* and *Psychomorpha*.

It is not to Harris, therefore, that we owe the mess of genera known as *Zygænidæ* in Mr. Grote's most recent list.

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Several species and quite a number of larvæ are described here for the first time.

In 1855, Burmeister gave a "Systematische Uebersicht der Sphingidæ Brasiliens," (Verh. Naturforsch. Ges. zu Halle, III 58–74) in which he gives a definition of the family and describes the genera and species, and gives also what is known of the larval history. He attributes considerable importance to the structure of the tarsal claw and its appendages, which has not, however, been borne out by the examinations made by me.

No subfamily divisions are used, and the sequence of genera is as follows, new genera being starred: *Philampelus*, *Deilephila*, *Protoparce*,* *Pseudosphinx*,* *Sphinx*, *Dilophonota*,* *Ambulyx*, *Smerinthus*, *Pterogon* and *Macroglossa*.

To *Philampelus* he refers, as a section, *Ph. tersa* as well as the other species still referred to this genus, saying, however, that Duponchel and Duncan had each created a genus for it, and in his opinion properly.

To *Deilephila*, *ficus* is referred as sole species, and the differences between it and the European species are detailed with no suggestion that it might form a generic type.

Protoparce is created for *rustica*, and a series of species said to represent the *Acherontia* group of the Eastern hemisphere. The characterization points to the type, and the species usually referred to *Macrosila*, but as additional North American species, Burmeister refers *brontes*, *hylæus*, *plebeja*, *sordida* and *coniferarum*, evidently without autoptic knowledge of the species.

To *Pseudosphinx* is referred *tetrio* as sole species.

Sphinx contains as § A, *S. jatrophæ*, distinguished by the horny palpal structure, as § B, not so distinguished, *florestan*, *lichenea*, *pamphilius*, *cingulata*, *hannibal* and *paphus*.

Dilophonota is created for *S. ello*, *alope*, *œnotrus*, *cacus* and *caricæ*, all congeneric forms, the genus being an extremely well defined one.

Ambulyx contains two species: *strigilis* and *gannascus*.

Smerinthus is said to be unrepresented in the Brazilian fauna, and the North American species *excæcatus*, *astylus* and *jamaicensis*, are briefly referred to.

To *Pterogon* are referred *lugubris*, *danum*, *camertus* and *lyctus*.

Finally, as *Macroglossa*, we find *tantalus* and *titan*.

As a whole Burmeister's work is not much of an advance in classification, nor did he know a goodly proportion of the species cited

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by him. No reasons are given for the sequence, and only two large divisions are adopted: the 1st, broad winged, without anal tufts containing all the genera save *Pterogon* and *Macroglossa*, which form group 2, distinguished by narrow wings and tufted anal segment.

Bearing date 1857, Walker, in the eighth volume of the "British Museum Catalogue of Lepidoptera," gives a monograph of the Sphingidæ of the world. This is really the first attempt at a complete monograph, and a mine of information concerning the literature of the family, whatever may be said of the work in other respects.

The term *Sphingidæ* is used to include the *Sesiæ*, and the whole series is divided into two tribes, viz.: SESII and SPHINGII. The SESII contain two families: *Stygiidæ* and *Ægeriidæ*, the latter family including the genera *Thyretes*, *Thyris* and *Ama*, usually separated as a distinct family.

The SPHINGII are included in one family, *Sphingidæ*, and the best way to give an idea of the classification adopted is to reproduce the Synopsis of Genera, premising that the translation (from the Latin) is a free one, and that generic synonyms are omitted here.

Abdomen tufted at apex.
  Anterior wings with the outer margin entire.
    Wings hyaline..... **Sesia.**
    Wings opaque, with scaly clothing..... **Macroglossa.**
  Anterior wings with the outer margin excised.
    Thorax not crested.
      Antennæ clavate..... **Proserpinus.**
      Antennæ not clavate.
        Primaries without silvery spots.
          Head not conic..... **Thyreus.**
          Head conic.
            Primaries with outer margin hardly excised.
              Wings with outer margin hardly dentate..... **Perigonia.**
              Wings with outer margin moderately dentate..... **Temnora.**
            Primaries with outer margin moderately excised..... **Lophura.**
        Primaries with silvered spots..... **Calliomma.**
    Thorax crested..... **Enyo.**
Abdomen untufted at apex.
  Wings very long.
    Abdomen slender, gracile..... **Ambulyx.**
    Abdomen stout, thick..... **Calymnia.**
  Wings not very long.
    Tongue long, or very long.
      Abdomen long, or moderately long.
        Abdomen with silvery spots..... **Basiothia.**
        Abdomen with silvery, golden, or pallid stripes.

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Outer margin of primaries straight.
Wings narrow.....**Chœrocampa.**
Wings wider.....**Elibia.**
Outer margin of primaries waved or dentate.
Wings narrow.
Posterior tibiæ with long spurs.
Margin of primaries denticulate.....**Pergesa.**
Outer margin entire .....**Panacra.**
Posterior tibiæ with short spurs.....**Unzela.**
Wings broader .....**Didoside.**
Abdomen without metallic spots or vittæ.
Abdomen obconic, moderately long.
Head rather small.
Outer margin of primaries not waved.....**Deilephila.**
Outer margin denticulate.....**Darapsa.**
Head large.
Antennæ distinctly thickened and pointed at tip.
Philampelus.
Antennæ subfiliform.....**Daphnis.**
Head very large.
Size large.....**Pachylia.**
Size moderate.
Primaries with apices not acuminate.....**Zonilia.**
Primaries with apices acuminate.....**Oryba.**
Abdomen long, cylindric, or cylindroconic.
Proboscis long, abdomen stout, very long; wings very broad.
Macrosila.
Proboscis long, or very long; abdomen medium long and stout; wings long and narrow. .....**Sphinx.**
Proboscis medium; abdomen medium, long and stout; wings long and narrow.....**Anceryx.**
Abdomen long, wings short and broad.....**Dolba.**
Abdomen rather slender, moderately long, wings long and broad.
Daremma.
Wings short .....**Œnosandra.**
Head small; proboscis of medium length; antennæ slender; abdomen linear, rather graceful; feet slender; wings rather narrow, not long.....**Lapara.**
Abdomen short.....**Cizara.**
Proboscis short or wanting.
Palpi not porrect.
Head large.....**Acherontia.**
Head medium and retracted.
Primaries with exterior margin entire.
Wings long.
Primaries with interior margin not incised.....**Basiana.**
Primaries with the interior margin incised.....**Daphnusa.**
Primaries with outer margin dentate or excised....**Smerinthus.**
Palpi porrect, exceeding the front.
Wings broad. .....**Cœquosa.**
Wings moderately narrow.....**Ceratomia.**

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The arrangement here is from *Macroglossa* to *Smerinthus*, and whatever the just objections to the work, it is an extremely valuable one to the student, bringing together all the known literature of the group to that date, and better generic characterizations than theretofore,—not much praise by-the-bye.

Bearing date also in 1857, but probably not issued until after the appearance of Walker's work, is Horsfield and Moore's Catalogue of the Lepidopterous Insects in the Museum of the Hon. East India Company, vol. 1.

Here the tribe "SPHINGES" is divided into five distinct stirpes, deriving their names from the form and shape of the larva, somewhat after the manner of the Wiener Verzeichniss.

The first stirps is not named, and is simply referred to as including *Castnia* and allies.

Stirps II, *Elongatæ*, has a cylindrical larva more slender and elongate than in the other stirpes. It is generally without lateral ocelli, the head is globular and the caudal horn short and rigid. The imago has short wings, a diurnal flight, and the abdomen terminated by a broad and depressed brush-like appendage. The proboscis is long. In their metamorphosis the species exhibit a slight affinity to the Diurna. The typical genera are *Sesia* and *Macroglossa*.

The third stirps—the ACROCEPHALÆ, W. V.—has larvæ with a head almost triangular, or acuminate above, the body being obliquely striated, generally with yellow,—naked and somewhat rugose; the caudal horn of moderate size, smooth and marked with a peculiar color. The perfect insect is strikingly distinguished by its angulated or excavated wings. The proboscis is very short or obsolete. The typical genus is *Smerinthus*.

The fourth stirps is called AMBLOCEPHALÆ. The larvæ have an ovate, truncated head; they are nearly naked and even on the surface; the caudal horn is lengthened, tuberculated and curved. The perfect insect has entire, lanceolate wings; the abdomen is marked with oblique lateral striæ. The proboscis is large and strong, and this character is strikingly manifested in the pupa. The typical genera are *Acherontia* and *Sphinx*.

The fifth stirps, characteristically named in the Wiener Verzeichniss "Augen Raupen" *larvæ ophthalmica*, has a larva with a small, globose, retractile head, and is, moreover, strikingly distinguished by the ocelli, with which it is marked, and which are also observed on the chrysalis. These ocelli, or eyes, are placed in some genera behind

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the head only, while in others they exist in a regular row along the entire larva, and in some cases are very prominent and brilliant. The metamorphosis takes place on the surface of the earth, the pupa in some cases covered with a slight web. The pupa is enlarged towards the head, and is generally provided with an annular case covering the proboscis which is not so large as in the preceding stirps. In the imago the abdomen is long and acute, and the insects in many cases have the habits of a *vespertilio*. The typical genera are *Deilephila* and *Chœrocampa*. The arrangement of genera is:

Stirps I.—Omitted from the Catalogue.

Stirps II.—*Sesia*, *Sataspes* Moore, *Macroglossa*, *Lophura*.

Stirps III.—*Smerinthus* only.

Stirps IV.—*Leucophlebia*, *Basiana*, *Ambulyx*, *Calymnia*, *Acherontia*, *Sphinx*, *Macrosila*, *Zonilia*.

Stirps V.—*Panacra*, *Philampelus*, *Darapsa*, *Daphnis*, *Pergesa*, *Elibia*, *Deilephila*, *Chœrocampa*.

Some of the genera enumerated are not represented in our fauna, but enough of them are familiar to enable the student to appreciate the arrangement according to larval structure, by which the *Smerinthinæ* are sandwiched in between two groups of typical *Sphinginæ*.

In 1859, Clemens, in the Jour. Ac. N. Sci. Phil., gives a synopsis of the American Sphingidæ. He first gives a very careful review of some of the structural peculiarities of the family, speculating on the use and development of several organs, and restricts the family to the *Legitimæ* Linn.

In essentials he follows, while he elaborates and somewhat improves on Walker, whose errors, however, are very generally copied.

The order of genera is as follows: *Sesia*, *Macroglossa* (for *Lepisesia* and *Allopus*), *Proserpinus*, *Thyreus*, *Deidamia*, *Enyo*, *Deilephila*, *Darapsa*, *Chœrocampa*, *Philampelus*, *Pachylia*, *Macrosila*, *Sphinx*, *Anceryx*, *Dolba*, *Ceratomia*, *Smerinthus*, *Daremma*, *Œnosandra*, *Lapara*, *Ellema* and *Arctonotus*.

In 1862, Morris, in his "Synopsis" published by the Smithsonian Inst., follows Clemens.

Since that time no monographic revision of all the American forms has been attempted, while the monographs of Boisduval and Butler hereinafter noted, both cover the Sphingidæ of the world.

In 1865, Mr. Grote gives some notes on the Sphingidæ of Cuba, following it by a list of species. The genera are not defined, and the arrangement is closely that of Walker. In the same year, and in

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the same publication (Proc. Ent. Soc. Phil. v), is an elaborate paper: "A Synonymical Catalogue of North American Sphingidæ, with notes and descriptions," by Messrs. Grote & Robinson, which marks a decided epoch in the American history of the family. A number of new genera and species are described, some errors of synonymy corrected, while Walker's bibliography is pretty generally quoted in full. The divisions are not defined, nor is any reason given for the particular arrangement adopted. The scheme is as follows:

Family SPHINGIDÆ.

Tribe MACROGLOSSINÆ.

Genera *Lepisesia*, *Sesia*, *Hæmorrhagia*, *Ællopos*, *Eupyrrhoglossum* (Cuban), *Thyreus*, *Amphion*, *Deidamia*, *Proserpinus*, *Euproserpinus*, *Enyo*, *Hemeroplanes*, *Perigonia*, *Calliomma* (the last three Cuban).

Tribe CHŒROCAMPINI.

Genera *Otus*, *Darapsa*, *Pergesa* (Cuban), *Chærocampa*, *Deilephila*, *Philampelus*, *Pachylia*, *Ambulyx* (Cuban).

Tribe SMERINTHINI.

Genera *Smerinthus*, *Cressonia*.

Tribe SPHINGINI.

Genera *Pseudosphinx* (Cuban), *Amphonyx*, *Macrosila*, *Diludia*, *Syzygia*, *Daremma*, *Ceratomia*, *Sphinx*, *Dolba*, *Hyloicus*, *Ellema*, *Lapara*, *Erinnyis*, *Cautethia*, *Arctonotus*.

In 1873, in the Buffalo Bulletin I, 17, Mr. Grote gives a list of the American Sphingidæ, differing in *toto* from the preceding, no reason for the change being given. The scheme here is:

SPHINGIDÆ.

Subfamily BOMBYLIÆ Hübner.

Tribe VULGARES Hübner.

Genera *Arctonotus*, *Lepisesia*, *Hemaris*, *Hæmorrhagia*, *Ællopos*, *Euproserpinus*.

Tribe ÆQUIVOCÆ Hübner.

Genera *Thyreus*, *Amphion*, *Enyo*, *Deidamia*, *Proserpinus*.

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Subfamily DEILEPHILÆ Hübner.

Tribe PALLIDIVENOSÆ Hübner.

Genera *Deilephila*, *Dupo* (for vitis and linnei), *Philampelus* (for *pandorus* and *achemon*), *Pachylia*, *Argeus*.

Tribe OBLIQUOSTRIATÆ Hübner.

Genus *Metopsilus*.

Tribe UNCINNATI Hübner.

Genus *Darapsa*.

Subfamily SMERINTHI Hübner.

Tribe ANGULATI Hübner.

Genera *Paonia*, *Calasymbolus*, *Smerinthus*.

Tribe DENTATÆ Hübner.

Genera *Laothoe*, *Cressonia*.

Subfamily MANDUCÆ Hübner.

Tribe PONDOROSÆ Hübner.

Genera *Ceratomia*, *Daremma*, *Diludia* (brontes, jasminearum), *Macrosila*, *Sphinx* (drupiferarum, kalmiæ, chersis), *Lethia* (gordius, luscitiosa), *Agrius* (eremitus, lugens), *Dolba* (hylæus).

Tribe LEVES Hübner.

Genera *Dilophonota*, *Hyloicus*, *Ellema*, *Lapara*.

It will be seen that here the Verzeichniss is used as a guide exclusively, and *Arctonotus* now heads the series.

Boisduval, in 1874, in the Species General, Het. I, restricts his SPHINGIDES to the Legitimæ, excluding the Sésiides, under the term ENDOPHYTES as a separate family, following, in this respect, earlier authors.

The true Sphinges are divided into six tribes:

I.—ACHERONTIDES, with the single genus *Acherontia*.

II.—SMERINTHIDES, with the genera *Brachyglossa*, *Metagastes*, *Calymnia*, *Euclea*, *Nyceryx*, *Smerinthus*, *Eurypteryx*, *Basiana*, *Daphnusa*, *Cypa* and *Ceratomia*. All our North American species are included in the generic term *Smerinthus*, none of the Hübnerian or Grotean terms being recognized. The genus *Ceratomia* is placed in this tribe, quite contrary to previous and subsequent writers.

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III.—LEUCOPHLEBIDES, with the single (Indian) genus *Leucophlebia*.

IV.—EURYGLOTTIDES, with the genera *Megnoton*, *Macrosila* [not as used by American authors], *Amphonyx*, *Euryglottis*, *Sphinx*, *Anceryx*, *Pachylia*, *Zonilia*, *Madoryx*.

The term *Sphinx* is used in an extremely wide sense, including the genera *Phlegethontius*, *Sphinx*, *Dolba*, *Hyloicus*, *Ellema*, *Daremma* and *Diludia* of our lists. Quite unusually *Pachylia* is placed far from *Philampelus*, of which it is certainly a close ally.

V.—DEILEPHILIDES, with the genera *Deilephila*, *Elibia*, *Ambulyx*, *Philampelus*, *Aleuron*, *Everyx*, *Euchloron*, *Acosmeryx*, *Eucheryx*, *Chærocampa*, *Panacra*.

Of these *Chærocampa* presents a great diversity of forms, thirteen groups being recognized, some of which had been before, or have been since recognized as good genera.

VI.—MACROGLOSSIDES, with the genera *Temnora*, *Lapara*, *Arctonotus*, *Tylognathus*, *Epistor*, *Trichocolon* [Deidamia], *Ocyton*, *Aspledon*, *Pterogon*, *Pogocolon*, *Angonyx*, *Perigonia*, *Microlopha*, *Thyreus*, *Macroglossa*, *Sataspes* and *Dasysphinx*.

The excuse for placing *Lapara* [*Ellema*] with this tribe must be sought in the statement that the genus and species were unknown to him in nature, and it affords at the same time a drastic commentary upon the misleading character of the description, that the species, which is a synonym of this, should be placed so far from it in a classification based upon characters not used in the original description of the species.

The *Smerinthini* here lead the series, and the lead is through the *Macroglossæ* into the *Sesiides*.

In 1875, in the second volume of the Bull. Buff. Soc. Nat. Sci., Mr. Grote gives a "New Check List of North American Sphinges" decidedly differing from that given in the previous volume. The arrangement here is as follows:

SPHINGES Linn. restr.

CAUDIBERBES Borkh.

Hemaris, *Hæmorhagia*, *Ællopos*, *Euproserpinus*, *Arctonotus*, *Lepisesia*, *Proserpinus*, *Amphion*, *Thyreus*, *Enyo*, *Deidamia*.

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EUMORPHÆ Hüb.

Hyles (for chamænerii), *Deilephila* (for lineata), *Dupo* (vitis and linnei), *Philampelus* (pandorus and achemon) *Argeus, Pachylia, Metopsilus, Darapsa.*

PHALÆNOIDES Borkh.

Paonias (excæcatus and myops), *Calasymbolus* (astylus), *Smerinthus, Amorpha* (modesta), *Cressonia.*

MANDUCÆ Hüb.

Ceratomia, Daremma, Diludia, Amphonyx, Macrosila, Sphinx, Lethia (gordius and luscitiosa), *Agrius* (eremitus and lugens), *Dolba, Dilophonota, Hyloicus, Lapara.*

In the "Trans. Zool. Soc. Lond." ix, pp. 511–644, pl. xc–xciv, is Mr. Butler's "Revision of the Heterocerous Lepidoptera of the family Sphingidæ," read Feb. 1, 1877.

Mr. Butler here classifies the family as follows:

1. MACROGLOSSINÆ.

Larva with the anterior segments tapering towards the head, retractile; horn long and curved, head rather small.

Imago generally with externally angulated palpi, the antennæ often gradually thickened from the base to the apex; thorax large and prominent; abdomen of the ♂ always with a more or less developed anal tuft of hair scales.

2. CHŒROCAMPINÆ.

Larvæ with the anterior segments retractile, the fifth somewhat abruptly broader; the fifth and sometimes all the segments laterally ocellated; horn variable; head rather larger.

Imago generally with externally rounded palpi, the antennæ generally rather slender; eyes salient, thorax large and prominent; abdomen without an anal tuft.

3. AMBULICINÆ.

Larva with the anterior segments non-retractile, tapering slightly towards the head, which is abruptly rather larger and rounded; horn oblique, not curved, but slightly pointing upwards at tip; a series of lateral oblique stripes.

Imago with externally rounded palpi, the antennæ slender in both sexes; eyes salient; thorax rather short; abdomen of the ♂ produced behind with lateral angular expansion.

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4. SMERINTHINÆ.

Larva rugose, with the anterior segments tapering towards the head, which is abruptly and decidedly larger, flattened in front and angular above, horn straight.

Imago with the head and thorax short and broad; palpi small, antennæ of ♂ more or less pectinated.

5. ACHERONTINÆ.

Larva thick, clumsy, Sphinx-like, but with the horn always more or less recurved at the tip and tuberculate or granulose.

Imago clumsy; legs, antennæ and proboscis thick, the latter very short; head, thorax and abdomen short and broad.

6. SPHINGINÆ.

Larva with the anterior segments very slightly smaller than the posterior, generally marked with oblique lateral stripes; horn (when present) rather long; head tolerably large; position of the larva in repose almost sigmoidal.

Pupa with an external sheath for the proboscis.

Imago, Chœrocampine in form, but with the head generally smaller, the thorax variable in length, proboscis very long.

Mr. Butler evidently derives most of his group characters from the larval stages; as applied to the American genera, the sequence is as follows:

MACROGLOSSINÆ.

Lepisesia, *Hemaris* (incl. Hæmorrhagia), *Macroglossa* (for errato Bd.), *Ællopos*, *Thyreus*, *Amphion*, *Deidamia*, *Proserpinus*, *Euproserpinus*, *Enyo*.

CHŒROCAMPINÆ.

Otus, *Ampelophaga*, *Phœrocampa*, *Darapsa*, *Deilephila*, *Philampelus*, *Argeus*, *Pachylia*.

AMBULICINÆ.

Are not North American.

SMERINTHINÆ.

Triptogon, *Cressonia*, *Paonias*, *Calasymbolus*, *Smerinthus*.

ACHERONTINÆ.

Contains no North American genera.

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SPHINGINÆ.

Amphonyx, Cautethia Dilophonota, Macrosila, Protoparce, Daremma, Dolba, Diludia, Hyloicus, Sphinx, Lintneria, Ceratomia, Ellema, Lapara.

The genus *Arctonotus* was unknown to Mr. Butler, and is placed among the doubtful *Sphingidæ*.

Mr. Butler does not define the generic terms used by him. except when new, so that except for the aggregation of the species it is not easy to know what Mr. Butler's ideas of the limit of the terms are.

At all events the paper is an important one, and I have followed it closely in the synonymy where unable to verify it myself, believing that Mr. Butler would not suppress a species without good cause. His material, too, was probably much larger in the case of the subtropical forms than that at the command of any previous author.

In 1877, in the third volume of the Buff. Bull., Mr. Grote gave yet another list, retaining the main divisions and general arrangement of the previous list, and adding species since described. In the CAUDIBERBES, *Chamæsesia* is added for *gracilis*, referred to *Hæmorrhagia* in the previous list. In the EUMORPHÆ, *Elibia* is used for *versicolor*, previously referred to *Darapsa*, and *Everyx* is used for the other species of *Darapsa*.

In the PHALÆNOIDES, *Calasymbolus* now contains also *myops; Eusmerinthus* is added for *geminatus* and *cerisii*, and *Triptogon* replaces *Amorpha*.

In the MANDUCÆ, *Phlegethontius* replaces *Macrosila; Lethia* is included in *Sphinx*, as is also *Agrius lugens*, while *Lintneria* is substituted for *Agrius eremitus*.

These changes, as Mr. Grote says, were induced by a study of the works of Boisduval and Butler, and are partly explained in footnotes. Evidently no personal study was made and no reason is given for separating such closely allied forms as *lugens* and *eremitus*. In fact nothing in this, or in the previous lists indicates that any but the most superficial study of the family was ever attempted by Mr. Grote.

Worthy of mention here is a paper by P. Maassen Stett. Ent. Zeit. 1880, v, 41, pp. 49–72, reviewing Mr. Butler's work in the Sphingidæ. The author professes to be an admirer of Boisduval, and roughly criticises Butler for his disagreement with that author. He makes many notes on American species and their synonymy, some of them

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from their tenor and their style like inspirations from Mr. Strecker, especially in the "aside" reflections on Mr. Grote.

Many of the synonymical remarks are correct, though previously made by others, while some argue either ignorance of the species or great carelessness in examination, e. g. that *Deidamia = Pterogon; Ellema = Sphinx; H. metathetis = axillaris*, etc. It is a pity that by an arrogant assumption of correctness and a failure to credit information, the author has thrown doubt on his other statements not so easily verified.

In 1882, Mr. Grote, in the "New Check List," gave yet another version of the arrangement, which now reads as follows:

CAUDIBERBES.

Lepisesia, Hemaris (§§ *Hemaris, Chamœsesia, Hœmorrhagia*), *Ællopos, Euproserpinus, Cautethia, Pogocolon, Amphion, Thyreus, Enyo, Deidamia, Arctonotus.*

EUMORPHÆ.

Deilephila, Philampelus, Argeus, Pachylia, Chœrocampa, Everyx, Ampelophaga.

PHALÆNOIDES.

Smerinthus, Paonias, Calasymbolus, Triptogon, Cressonia.

MANDUCÆ.

Ceratomia, Daremma, Diludia, Amphonyx, Phlegethontius, Sphinx, Dolba, Dilophonota, Hyloicus, Ellema, Exedrium.

In 1885, in vol. 1, Ent. Am. in the series of Introductory papers on Lepidoptera, I gave a synopsis of the genera as a result of original study, somewhat reducing the number of genera, and enlarging the term Sphinx to an extent nearly as great as Boisduval. The following is a reproduction of the table, which will best show the characters used:

Tongue long, strong, corneous ..... **SPHINGIDES** 1.
Tongue short, weak, membraneous ..... **SMERINTHIDES** 8.
1.—Antennæ clubbed at tip and furnished with a short bent hook ..... 2.
Antennæ not clubbed, equal, or thickest at middle, either bent at tip or slender, curved ..... 3.
2.—Tibiæ unarmed, wings more or less hyaline. ..... **Macroglossa.**
Tibiæ spinose, anterior armed at sides and tip. ..... **Pogocolon.**

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3.—Abdomen tufted at tip, and usually also at sides.....4.
Abdomen not tufted at tip or sides.....5.
4.—Body short, plump; abdomen pointed at tip; primaries excavated below apex and again before hind angle.....**Amphion.**
Abdomen elongate, flattened, rather abruptly terminated; anal tuft fan-like; primaries very narrow, pointed; antennæ very slender. **Ællopos.**
Abdomen short, obtuse; broad, with brush-like lateral tufts; antennæ thick, in ♂ serrate; primaries angulate and excavate.....**Thyreus.**
Abdomen conic, with a fan-like tuft at tip; thorax with a distinct sharp crest behind collar; primaries as in *Thyreus*.....**Enyo.**
5. -Spurs of middle and hind tibiæ very long, unequal; legs robust.....6.
Spurs of middle and hind tibiæ short, weak, more equal; legs weak. .....7.
6.—Prothorax not much extended before base of primaries; fore legs short and stout.
Abdomen conic, pointed, fore tibia and tarsi usually armed with spines or claws at outer side.....**Sphinx.**
Abdomen conic, pointed, head much broader; eyes larger; size very small; secondaries yellow with black margin.....**Cautethia.**
Abdomen obtuse at tip, head retracted, wings wider.....**Ceratomia.**
Prothorax more extended before the base of primaries, head larger, thorax robust; anterior legs longer, weaker; primaries with outer margin sinuate.
Abdomen obtuse.....**Pachylia.**
Abdomen conic; anterior tibia and tarsi unarmed.....**Philampelus.**
Abdomen conic; shorter; anterior tibia and tarsi with claw-like spines at outer side.....**Deilephila.**
Prothorax still further produced before base of primaries; head large; eyes very prominent; abdomen long and rather slender; thorax narrower.
Thorax untufted; third joint of palpi projecting forward like short horns; outer margin of primaries not dentate.....**Amphonyx.**
Thorax with divided crest, outer margin of primaries dentate. **Dilophonota.**
7.—Wings very narrow, small; abdomen long, conic, very smoothly clothed. **Chœrocampa.**
Broader winged, less robust; head more retracted; abdomen shorter, less regularly conic.....**Darapsa.**
Primaries angulated; abdomen obtuse, head crested, strongly retracted; ♂ antennæ serrate.....**Deidamia.**
8.—Primaries with outer margin scalloped, or evenly crenulated.
Anterior tibia with a heavy claw at tip.....**Triptogon.**
Anterior tibia unarmed.....**Paonias.**
Primaries with outer margin excavate and angulate.....**Smerinthus.**
Primaries with outer margin evenly dentate; third joint of palpi unusually long; divaricate at tip.....**Cressonia.**
Primaries with outer margin even.
Anterior tibia armed with a series of long claws; plump, robust; body woolly.....**Arctonotus.**
Anterior tibia unarmed; form more slender, less robust.....**Ellema.**

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In 1886 in a very well written pamphlet on "The Sphingidæ of New England," Prof. Fernald gives very careful and accurate descriptions of the genera and species of this section. Many of my suggestions are adopted, while the Professor differs considerably in his estimate of certain genera.

The generic descriptions are careful and complete, and in this paper I have drawn largely from them, finding them in almost every instance absolutely correct. Characters not noted by previous authors are here fully described, and the paper, limited as is its scope, is a positive and valuable addition to our knowledge. As far as possible the descriptions of the early stages are also given, and to the beginner this little pamphlet is invaluable, as it is clear and simple, and yet scientifically accurate.

I reproduce his table of genera:

Tongue long and horny.....2.
Tongue short and membraneous.....**Smerinthinæ** 16.
2.—Abdomen with a well-developed anal tuft, flight usually diurnal.
Macroglossinæ 4.
Abdomen untufted, flight crepuscular, or nocturnal..... 3.
3.—Thorax tufted, outer margin of wings obliquely rounded...**Sphinginæ** 7.
Thorax untufted, outer margin of wings more or less excavate.
Chœrocampinæ 12.
4.—The middle of the wings transparent.....**Hemaris.**
The middle of the wings opaque.....5
5.—Outer margin of the fore wings entire.....**Lepisesia.**
Outer margin of the fore wings angulated.....6.
6.—Fore tibia spinose.....**Amphion.**
Fore tibia not spinose.....**Thyreus.**
7.—Eyes strongly ciliated.....8.
Eyes scarcely, or not ciliated.....10.
8.—Fore tibiæ spinose.....9.
Fore tibiæ not spinose.....**Dolba.**
9.—First joint of fore tarsi with a row of three or four stout curved spines on the outside.....**Hyloicus.**
First joint of four tarsi without stout curved spines on the outside.
Sphinx.
10.—Head prominent; eyes large; palpi well developed...**Phlegethontius.**
Head sunken into the thorax; eyes small; palpi short.....11.
11.—Outer margin of fore wings excavate on vein 2.....**Ceratomia.**
Outer margin of fore wings entire, rounded.....**Daremma.**
12.—Outer margin of fore wings angulated.....**Deidamia.**
Outer margin of fore wings entire, or sinuous.....13.
13.—Antennæ straight; largest near the outer end.....**Deilephila.**
Antennæ largest in the middle; hooked at the outer end.....14.
14.—Spurs of the middle and hind tibiæ short, legs weak.....15.
Spurs of the middle and hind tibiæ long, legs stout.....**Philampelus.**

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15.--Scales of the head lying smooth and flat.....**Chœrocampa.**
Scales of the head in a ridge or tuft between the antennæ.....**Everyx.**
16.—Outer margin of the fore wings evenly rounded and entire.....**Ellema.**
Outer margin of the fore wings scalloped, or more or less angulate.....17.
17.--Fore tibiæ with a stout spine at tip; large species.....**Triptogon.**
All the tibiæ spinose; medium sized species.....**Cressonia.**
Tibiæ not spinose; medium sized species; hind wings with an eye spot...18.
18.--Outer margin of the fore wings scalloped.....**Paonias.**
Outer margin of the fore wings more or less angulated.....**Smerinthus.**

This is followed by a synopsis of the larvæ so far as known, which need not, however, be reproduced here.

Prof. Fernald recognizes four subfamilies, following somewhat my arrangement of the genera, in the location of *Deidamia* and *Ellema* and in the situation of the *Smerinthinæ*.

His arrangement is as follows:

MACROGLOSSINÆ: *Hemaris, Aellopos, Lepisesia, Amphion, Thyreus.*

SPHINGINÆ: *Ceratomia, Daremma, Phlegethontius, Sphinx, Dolba, Dilophonota, Hyloicus.*

CHŒROCAMPINÆ: *Deilephila, Philampelus, Chœrocampa, Everyx, Deidamia.*

SMERINTHINÆ: *Triptogon, Paonias, Smerinthus, Cressonia, Ellema.*

In marked contrast to the above, is a pamphlet by Mr. A. R. Grote, in 1887, on "The Hawk Moths of North America." This is a loose treatment of the *Sphingidæ* of the Atlantic region, with indefinite descriptions in popular style of the genera and species, largely culled from Prof. Fernald's paper and with some remarks on the geographic distribution of genera and species, which form the most interesting and useful part of the whole work.

The genera *Deilonche* for *Chœr. tersa*, *Atreus* for *Sphinx plebeius* and *Copismerinthus* for *Smer. cerysii*, are created on information gained from Prof. Fernald's paper.

The arrangement in the Check List of 1882 is retained in essentials, except that the subfamily terms MACROGLOSSINÆ, etc., are here used to replace the inexpressive terms for the sections used in the list.

This enumeration of authors is by no means complete, but it embraces all those who have either done general monographic work, or have done similar work on the American species. Many authors have given us isolated descriptions of genera and species. Besides the older illustrated works of Drury, Cramer and Abbot, Mr. Strecker has, in recent times, very acceptably figured a large proportion of our species.

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Not the least valuable part of the work done on the group has been done in the descriptions of early stages, and among these the many detailed descriptions of life histories by Prof. Lintner rank high, while the excellent figures of the early stages of many of our species furnished by Prof. Riley have perhaps done more to familiarize their appearance and habits to those interested in entomology, scientific or economic, than all word descriptions taken together.

It remains now to outline the classification which my study of the family has led me to adopt, and this is not materially different from that of some of the other authors. Larval characters are omitted entirely. I recognize four subfamilies: *Macroglossinæ*, *Chærocampinæ*, *Sphinginæ* and *Smerinthinæ*.

The order of these I change from that adopted by me heretofore, placing the *Sphinginæ* after instead of before the *Chærocampinæ*. It need scarcely be noted that I have taken into account North American forms only, and have but seldom had recourse to exotics when the determination of a type made it necessary.

The *Macroglossinæ* are usually placed at the head of the series, because of their diurnal habit, and the general idea that it is the most specialized group in the family. Boisduval, however, sees in the tufted abdomen and often hyaline wings, an approach to the *Sesiidæ*, and places this subfamily at the foot of his series.

As they stand in Mr. Grote's "New List" this subfamily—in Hübnerian jargon "Caudiberbes" yclept—has not a single character to hold it together. Excluding *Cautethia*, the laterally or anally tufted abdomen furnishes a base for the association. The group contains species with clubbed antennæ; species with fusiform antennæ, and species with almost setaceous antennæ. The head may be broad and prominent, or it may be small and retracted. The tongue in some is very long and strong, in others it is weak and short. Some have a slender, graceful habitus, others are heavy and obese; in short there is a most beautiful mixture. The explanation seems to be that in this assemblage were placed all those aberrant forms which were excrescences or abnormal developments, from whatever source.

I have restricted the subfamily to those forms in which the antennæ are distinctly clavate, or enlarged at or before the tip.

The type of the genus *Macroglossa*, and consequently of the subfamily, is *M. stellatarum*, a species closely resembling the form of *Aellopos*, but with distinctly clavate antennæ. *Macroglossa croatica* is not, I believe, congeneric with *stellatarum*, but seems to be so with

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our species of *Hemaris*. The discussion of further differences belongs to another place, and the subfamily character only need be noted here.

The *Chærocampinæ* have species the most diverse in habitus. None of them, however, have distinctly clavate antennæ, and none of them, unless the abdomen is tufted anally or at sides, have entire or even outer margins. There is no strong structural character isolating the subfamily. I have here placed all those genera eliminated from the *Macroglossinæ*, forming of them a small group of aberrant forms without definite or close relation to other forms in our fauna and which must be placed in connection with work on other faunas. Such forms as *Enyo* and *Aellopos* are spurs from a tropical fauna, showing numerous similar forms and perhaps entitled to subfamily rank when properly associated.

A tendency throughout this family is to bright colors and distinct shades and bands in wing maculation. The abdomen is rarely banded, and there are no sober gray forms represented.

A very large proportion of our species in the larval state will feed on grape, or *Ampelopsis*. In fact, there are but three exceptions to this rule, though many of those on grape will also feed on other plants.

This subfamily finds its greatest representation more southwardly, where many of the forms are of the most beautiful and graceful.

In contrast to the above the *Sphingidæ* are, as a rule, sober gray or brown insects of large or moderate size, with pointed wings and even outer margin, not sinuate or angulated as in the *Chærocampinæ*. The maculation consists either of simple, undulated, transverse lines like that in so many *Bombycidæ*, or of longitudinal interspaceal black dashes. Sometimes the primaries are a mottled surface of gray and black streaks without distinct pattern. Rarely the secondaries are red, brown, or yellow with black margins.

In this group there is a very general tendency to spinose, or armed tibiæ and tarsi, which in the former family is barely indicated in *Deilephila*. There is a gradual decrease in the length of tongue from forms like *celeus*, where it is five or six inches long, to forms like *Ellema harrisii*, where it is wanting, or a mere membraneous rudiment.

At the foot of the series are the *Smerinthinæ* with angulated wings, small, retracted head and obsolete tongue. Insects thoroughly bombiciform in habit and appearance, but completely Sphingiform in larval and imaginal characters.

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From my study of the family it appears to me that there are at least two very distinct series leading either from or to the *Bombycidæ*. The one seems to show an affinity to the *Ptilodonts* through *Ellema* and allies, and forms a very complete chain to the immense forms of typical *Sphinx*. This is a rather distinctive series with apparently few aberratic forms, but some branches toward the *Chærocampinæ*. The other seems to find closer allies in the *Saturniidæ* through *Cressonia* to the most typical *Smerinthinæ*. The affinities of this group are strongly with the *Chærocampinæ*, to which a tolerably complete chain, with *Deidamia* in a prominent place, can be constructed, though not from our fauna. Even to the *Macroglossidæ* forms like *Arctonotus* show distinct relationships, while the *Chærocampinæ* and *Macroglossinæ* are so closely related that it would not be at all difficult to complete the chain from a general study of the entire fauna.

In our fauna we may expect to discover little more in the way of new species. The high western plateaus and the mountain ranges there, may give us a few more inconspicuous species probably belonging to the genus *Sphinx*, or belonging at least to the subfamily. Yet how long a species may escape observation is illustrated by *Sphinx cupressi*, which was figured by Abbot many years ago, and has only been taken again in 1887.

There are few families, too, in which the larval history is so generally known. The larvæ are large, easily discovered, and, as a rule, not difficult to raise. Of the few of which we have no descriptions quite a fair proportion have been bred, but no history published.

In Prof. Riley's unpublished notes is a vast deal of information on the early stages of many of our species. This it has proved impossible to incorporate here at present, and will be the subject of a memoir by the professor at an early date.

In tabular form the Sphingidæ divide as follows:

Antennæ distinctly clubbed at tip..... .....**Macroglossinæ.**
Antennæ not distinctly clubbed, usually fusiform.
Tongue long and strong.
Primaries with outer margin sinuate or angulate.....**Chærocampinæ.**
Primaries with outer margin even..... .....**Sphingidæ ♂.**
Tongue weak and short.
Primaries with outer margin even.....**Sphinginæ ♀♀.**
Primaries angulated and dentated.....**Smerinthinæ.**

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Macroglossinæ.

This subfamily is at once separable from all the other *Sphingidæ* by the distinctly clavate antennæ, furnished at tip with a minute recurved hook. In some species, the majority in fact, the males have the joints lamellate inwardly, while in the females they are ciliate or entirely smooth. The only genus that at all approaches this subfamily in antennal structure is *Deilephila*, belonging to the *Chærocampinæ*, and to that some forms of *Lepisesia* are closely allied. The body is, as a rule, short, stout; the wings comparatively small, often hyaline in part; abdomen tufted, laterally or at tip, or both, sometimes inconspicuously so; head small; eyes small, round, usually lashed; the legs are moderate, subequal, rather sparsely clothed with fine hair. In habit the species are diurnal, flying in the hottest sunshine and hovering over flowers like the humming birds, to which they bear a resemblance when on the wing.

This characterization restricts the subfamily much more than has been done by previous authors. As the subfamily now stands in lists the only feature uniting them is the tufting of the abdomen, while in all other respects they vary widely.

As here restricted two genera belong to the subfamily,—*Hemaris* and *Lepisesia*, the latter term embracing the species listed as *Lepisesia*, *Euproserpinus* and *Pogocolon*.

The genera are easily distinguished; *Hemaris* contains the clear winged species, in which also the fore tibiæ are unarmed, while *Lepisesia* contains opaque winged forms in which the fore tibiæ are heavily armed outwardly and at tip with long stout spines or claws.

The species taken as a whole are not common, and as I could not get material enough under my control to make such dissections as I should have liked, the information in regard to genital structure is incomplete.

HEMARIS Dalm.

Vetensk. Akad. Hand. 1816, 207.

Head narrow, small, not retracted, untufted. Tongue as long as the body, stout, corneous. Palpi closely scaled, oblique, sometimes forming a more or less complete cone in front of the head. Eyes of medium size and lashed. Antennæ about two-thirds the length of costa, clavate, outwardly abruptly terminating in a minute and bent seta, biciliate in the males, simple in the females. Thorax smooth,

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tapering in front and prolonged in front of the primaries. Abdomen somewhat flattened beneath, with a broad, fan-like anal tuft. The posterior edge of the segments above is armed with minute, flattened spinules. The primaries are eleven veined, the outer margin rounded, entire, the centre of the wings transparent and crossed by the dark veins. Secondaries also transparent in the middle, the outer margin somewhat excavated between veins 1b and 2. The colors are black, with yellow and ferruginous maculation, and the species, when flying in the bright sunshine, bear a deceptive resemblance to humming birds, for which they are not infrequently mistaken.

In this genus I regret that the material at my command has been too incomplete to accord that careful study which it requires. There are many species described, and all sorts of opinions as to their validity. Boisduval's species are not satisfactorily identified in any collection, and are probably synonyms of others. Mr. Strecker's species are not certainly known to any but himself, while of the other species described, many of them are based upon characters which all analogy seems to prove evanescent.

In the few species of which I have been able to examine the male genitalia, I find an unexpected similarity amounting practically to identity of structure. This removes one important guide to the distinction of species and leaves us to more superficial characters. Of these, Mr. Henry Edwards has remarked that differences of color are here given specific value, which would not be accorded them in other genera. It is this fact which makes long series of bred specimens necessary to decide upon the range of variation. Many of the species have been bred, but apparently only in small numbers, and the results have never been carefully analyzed. I have, therefore, given descriptions here of all the described forms, mostly reproducing the original descriptions and supplementing them with such notes as I have made.

It may be added that the genitalia are of the typical Sphingid type, the supra-anal hook showing a decided tendency to divide—in fact it consists of two hooks closely joined along the median line.

The transformation of the larvæ takes place on the surface of the ground in an imperfect cocoon among the leaves.

As the best way to give an adequate idea of the characters used to separate the more common forms I will give a review of the work of Messrs. Grote & Robinson and of Mr. Grote singly upon the genus. The first paper was by Messrs. Grote & Robinson in the Ann. Lyc.

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N. H. N. Y. viii, 435. There the genus *Hæmorrhagia* is elaborately defined, and the species included are those with the generally deep red or brown colors as contrasted to those forms in which yellow forms the prevailing shade. This they divided as follows:

Group I (Aberrant).

Discal cell of primaries free; vitreous field of secondaries crossed by five nervules. Sp. 1.
Thorax beneath, with lateral red shades..... 1. **H. gracilis.**

Group II (Typical).

Discal cell of primaries crossed by a longitudinal bar.
Vitreous field of secondaries crossed by six nervules.
Inner margin of external band of ♂ primaries dentate on the interspaces. Sp. 2 and 3.
Abdomen shaded with olivaceous on the sides of the terminal segments. 2. **H. thysbe.**
Abdomen terminally entirely deep red.....3. **H. fuscicaudis.**
Inner margin of external band of ♂ primaries not dentate on the interspaces. Sp. 4 and 5.
Size moderate, hind tarsi red.....4. **H. buffaloensis.**
Size large, hind tarsi black .....5. **H. floridensis.**

In their other papers, while occasionally discussing the species of the genus, they make no changes save in suppressing the genus *Hæmorrhagia*, while they add no new species in this group. In the section *Hemaris* they give random notes, but no comparative or tabular statements.

In vol. 1 of the "Bulletin of the Buffalo Soc. N. Sci." Mr. Grote gives another synopsis of this group of the genus, adopting the following division:

Group I (Chamæsesia).

Discal cell of primaries free; vitreous field of secondaries crossed by five nervules.
Thorax beneath with lateral red shades; hind wings beneath with a pale shade at anal angle. ..... **gracilis.**

Group II (Hæmorrhagia).

Discal cell of primaries crossed by a longitudinal bar of scales, appearing as a prolongation of vein 5; vitreous field of secondaries crossed by six nervules.
Inner edge of external marginal band of the fore wings not dentate on the interspaces.
Size small (expanse 1.65—1.70 inch.). ..... **buffaloensis.**
Size moderate (expanse 1.80—2.20 inch.)..... **uniformis.**
Size large (expanse ♂ 2.40 inch.)..... **floridensis.**
Inner edge of external marginal band of the fore wings dentate on the interspaces.
Abdomen with the pre-anal segments olivaceous..... **thysbe.**
Abdomen terminally entirely deep red. ..... **fuscicaudis.**

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No other comparative description or synopsis of this group is given by Mr. Grote, and he contradicts his conclusions and negatives the value of one of his chief characters by classifying *uniformis* and *floridensis*, with entire margins, as varieties of *thysbe* with dentate margins. As to *floridensis* he revokes this determination, but leaves *uniformis* as a variety, abandoning the principle.

In vol. 2 of the same journal, p. 147, he gives a table of some species of the other section as follows:

Terminal band of primaries even on its inner edge.....**tenuis.**
Terminal band interspaceably roundedly exserted on its inner edge...**diffinis.**
Terminal band dentate on its inner edge.....**marginalis.**

It may be noted here that the extreme western forms, as a rule, differ from the eastern species in the thinner, more scanty vestiture, and shorter, more slender palpi. They have a peculiar shaggy appearance, which is very characteristic. Some of the eastern forms extend nearly to the Rocky Mountains, and retain their characters quite constantly. None of the species of the section *Hæmorrhagia* extend beyond the Rocky Mountains, and the species are perhaps best known.

In the treatment of this genus, considering the scantiness of the material at hand, I shall first give the descriptions, following Mr. Grote's catalogue adding what notes I can, and will then add a synopsis so far as I can make it up from the specimens at hand.

It may be stated here that in "Can. Nat. and Geol." 1859, p. 122, Dr. Gibbs records the fact that *Sesia thysbe* emits a squeaking sound. No one has since verified this observation.

H. palpalis Grt., Buff. Bull. ii, 145, *Hemaris;* Edw., Pr. Cal. Ac. Sci. v, 89, *Hemaris;* Butl., Trans. Zool. Soc. Lond. ix, 519, *Hemaris.*

Antennæ black. Head above pale sulphur-yellow, palpi bright orange with the tips black; tongue black; breast and sides of thorax beneath the wings pale sulphur-yellow. Thorax above, covered with olivaceous or rusty yellowish hair extending over the dorsum of the abdomen. Abdomen black, with the pre-anal segments tufted with light sulphur-yellow at the sides; anal hairs black. Legs black. Wings pellucid with narrow blackish-brown terminal borders, on the primaries even, inwardly a little irregular towards internal angle. Allied to the eastern *H. tenuis* and differing from all the species by the discolorous labial palpi. No perceivable reddish apical stain. Expands 1.85 inches; 46 mm.

Hab.—Gilroy, Brit. Col.

Of this species Mr. Edwards says (Pr. Cal. Ac. Sci. vi, 89): "Its chief difference from *thetis* seems to be in the darker shade of the labial palpi."

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I have nothing to add to this as the species is unknown to me. It is probably nothing more than a variety of *thetis*.

H. thetis Bd., Ann. Ent. Soc. Fr. iii, ser. 3, Bull. p. 32, 1865, *Macroglossa;* G. & R., Pr. E. S. Ph. v, 192, *Macroglossa;* Tr. A. E. S i, 325, pl. vi, fig. 36, *Sesia;* Edw., Pr. Cal. Ac. Sci. vi, 87, *Macroglossa;* Grt., Buff. Bull. i, 5, pl. 1, fig. 7, *Hemaris:* Bd., Sp. Gen. Het. i, 368, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 519, *Hemaris.*

Size and form of *S. diffinis.* Head above dull olivaceous; eyes narrowly circled with white scales; labial palpi yellowish beneath and on the sides, tipped with ferruginous inwardly and with superior, lateral, black scales tipping the terminal joint. Antennæ rather stout, blackish; beneath, the thoracic parts are clothed with pale yellowish scales, as are the anterior femora outwardly. Legs black. The thorax beneath is encroached upon centrally by the pale pectoral scales, but is elsewhere black; above, it is entirely obscure olivaceous. Abdomen above, black, shaded with brownish from over the base downwardly; the two pre-anal segments are entirely pale yellow, except centrally beneath, while dorsally the pale yellow scales are narrowly tinged with brownish. Anal segment and tuft black. Wings largely vitreous; anterior pair narrowly clothed with dark brownish scales along costal edge; an unusually narrow terminal band tapering to internal angle; a basal scale patch below median nervure outwardly obliquely bent on internal margin. Secondaries largely vitreous; a very narrow, even, terminal, dark brownish edging; from the base downward the internal margin is broadly clothed with dark scales; beneath as above; the wings at base are partially clothed with pale yellow scales. Expands 1.80 inches; 45 mm.

Hab.—California.

The above description is from Grote & Robinson; they say: "This species closely agrees in structure with *S. diffinis;* the body squammation is rough. The coloration of the body parts and the narrow edging of the wings, will at once distinguish the present from our common species from the Atlantic district."

In Buff. Bull. i, 5, Mr. Grote compares the species with *tenuis*, than which he says it is larger, "marginal band even, black and very narrow. Costal edge depressed, external margin more oblique, uneven and longer than in *tenuis.* No apical stain on primaries. The more robust California species may be distinguished by details of abdominal coloration.

Mr. Edwards in Pr. Cal. Ac. Sci. vi, 87, says that in fresh specimens there is always present on the hind tibia a bunch of long, pale yellow hairs, which are not visible in the somewhat worn and faded type specimens. "The presence of the reddish apical spot in the anterior wings is, I think, by no means a safe character, as in any one of my specimens it is quite apparent, while in two others it is entirely absent. This species may, however, be known by the thoracic and abdominal clothing, which is invaribly dull olivaceous,

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with a brownish tinge and is extended without any break to the yellow pre-anal segments." It is found in the valleys of California, chiefly in the neighborhood of the coast range, and may be sought for in May and June. It is especially attracted to the flowers of the species of *Lupinus*. Nothing is known of the early stages.

H. cynoglossum Hy. Edw., Pr. Calif. Ac. Sci. v, 88, *Hemaris;* Grt., Buff. Bull. iii, 220, *Hemaris;* Butler, Pap. i, 103.

Size of *H. thetis*. Head above pale yellowish olive; eyes margined behind with white scales. Palpi pale yellowish, with the terminal joint tipped with black. Thorax above bright greenish olive, without the brown tint observable in *thetis*. Basal segments of abdomen rich velvety black. Two pre-anal segments pale yellowish with a darker median shade. The under side of abdomen, including the anal tuft, is wholly black, except the edges of the pre-anal segments which are pale lemon yellow. The thorax is less covered beneath with yellowish hairs than in *thetis*, and the pale scales are hardly visible at the base of the wings, while the tufts of yellow hairs on the tibiæ, so eminently characteristic of *thetis* are here wholly wanting. The wings above and below are similar to the allied species, but are decidedly more opalescent, giving out a most beautiful bluish reflection. Antennæ blue-black. The fore wings are a little sharper at the apex than those of *thetis*. Taken on flowers of *Cynoglossum grande*.

Hab.—California, Vancouver.

This species differs from *thetis* more particularly in the absence of the yellow brush of hind tibiæ and the absence of colored hairs on the basal segments of the abdomen.

Mr. Edwards seems to believe that his species rests on rather a shaky foundation, and adds that "The species of the genus *Hemaris* are very closely allied, and can be separated only by characters which in other genera would hardly be considered as sufficient to indicate a difference of species."

This, however, seems to me a very distinct form. The pure black legs and basal segments of abdomen contrast strongly with the yellow, downy legs of *thetis* and *rubens*, which have the basal segments also more densely clothed with either yellowish or reddish hair.

The early stages of the species are unknown.

H. metathetis Butl., Tr. Zool. Soc. Lond. ix, 519, *Hemaris;* Pap. i, 103 Maassen, Stett. Ent. Zeit. 1880, xli, 51, = *axillaris*.

In the Ann. and Mag. N. H. Lond. ser. 4 vol. xiv, p. 366, Mr. Butler describes *Sesia Grotei* = *axillaris* stating that it was nearest to *axillaris* G. & R. Afterward, in the Tr. Zool. Soc. Lond. above cited, he speaks of *metathetis:* "This species was sent by Belfrage, labelled '*S. axillaris* Grote & Robinson,' which has led to my error; it differs in its smaller size, narrower and not dentated border, with other minor characters."

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In speaking of *H. cynoglossum* Hy. Edwards, in Pap. i, 103, Mr. Butler says: "This species is nearly allied to the Texan insect to which I gave the name of *H. metathetis*. It differs in being slightly smaller and with the external dark brown border of the primaries of only two-thirds the width; these appear to be the only noteworthy distinctions between the two forms."

Hab.—Texas.

In the Belfrage collection, which formed a part of the collection presented to the Museum by Prof. Riley, I find a single specimen fully answering Mr. Butler's brief characterization. As in Mr. Butler's specimen this also bears Mr. Belfrage's label *Sesia axillaris*, making it almost certain that it is the same form sent Mr. Butler under that name. This species is so close to *thetis* that I cannot find any seizable distinctive features. The material, however, is too scant to authorize a positive reference in this genus.*

H. rubens Hy. Edwards, Pr. Cal. Ac. Sci. vi, 88, *Hemaris*; Grt., Buff. Bull. iii, 220, *Hemaris*.

Mr. Edwards gives only a comparative description of this form. He says: "Under this name, if a true species, I wish to recognize two specimens in my collection in which the apical red mark is very distinct above and below, the oblique scale patch at the base of the primaries reddish and the costa and margins on the lower side also with a decided reddish hue. In *H. thetis* the two preanal segments alone are yellowish, but in the two specimens referred to above the yellow is carried on to the third segment, dorsally and beneath, but is interrupted on the sides by a black band. This appears to be a strong character, as in my examples of *thetis* the yellow shade is distinctly confined to the two pre-anal segments. Slightly smaller than *thetis*. The tuft of yellow hairs on the hind tibiæ is present in this species.

Hab.—Oregon, California.

In the specimens examined by me the abdominal maculation is not quite constant, though there are always more than two segments yellow. The species looks quite distinct from *thetis*, and is a good one I think.

* A good colored figure of *H. metathetis* kindly sent me by Mr. Butler proves my identification correct, and makes it certain that it is a slight variation only of *H. thetis*. Maassen's reference of the species to *axillaris* is wild.

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H. senta Strk., Rept. Chief of Engin. 1878–79, p. 1858, pl. ii, fig. 1, *Macroglossa;* Grote, New List, 1882, *Hemaris.*

Male expands 1½ inches. Above the head, thorax and first two and part of third segment of abdomen heavily clothed with olivaceous hair; beneath the first three segments of the abdomen are black; the remaining ones pale sulphur yellow with black in the middle: anal tuft black; antennæ black. Beneath, head and body are yellowish white. Legs clothed with yellowish white hair. Upper surface: wings hyaline, with the veins dark brown. Primaries, costa blackish, exterior margin of moderate width, widest at apex, scalloped on its inner edge, but not deeply, Indian-red in color, brightest at apex, and between the last two cells at and near the inner angle; in the middle this border is sprinkled or suffused with brownish; fringe dark brown: inner margin Indian-red, narrow at and near the inner angle, becoming very broad from middle of inner margin to base. Secondaries have a narrow exterior margin of dark brown, slightly scalloped inwardly and showing traces of red toward inner half. Abdominal margin broad and reddish, brightest at anal angle. Under surface, wings: Primaries, costa pale yellowish from base to over or about half its length; terminal half sprinkled heavily with dark brown; exterior margin with the red not so dark as above, but brighter; inner margin also not as dark as the outer half and pale yellow towards and at base. Secondaries with basal part, costa and inner margin pale yellow; exterior margin red; fringes of all wings brown.

One male; Fierra Amarilla, New Mexico, July 10.

"This beautiful little species is far more slender and delicate than *diffinis* or allies, and its position would be between the group of which *diffinis* B. is typical and the other composed of such species as *thysbe* F., *gracilis* Grt. etc. It can be distinguished at a glance from any other known American species."

This is almost surely *H. rubens* Hy. Edwards. I have examined a specimen of the latter which agrees very well with the description and figure. Mr. Edwards informs me that he has a specimen he takes to be this species and it seems to differ in the abdominal maculation. It seems to me that much reliance cannot be placed on this character in this species. The description is from Strecker's original characterization of the species.

H. æthra Strk., Lep. Rhop. et Het. 107, pl. xiii, fig. 2, id. p. 142, *Macroglossa;* Grt., New List 1882, *Hemaris;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 69, = *diffinis.*

"Female.—Expands 1⅛ inches. Above, head and body olivaceous, of a paler yellow shade toward the sides; caudal brush yellow and black, beneath same as *diffinis.* Primaries: margin much broader than in *diffinis* and serrated on inner edge; a large carmine apical spot; base and interior margin reddish, with olivaceous hairs on the former. Inferiors narrow, brown exterior margin. Abdominal margin carmine; beneath, costa of both wings red."

One example from Montreal, Canada. From Mr. P. Knetzing.

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"If this be not a new species it is certainly a most remarkable aberrant form of *diffinis;* the total absence of the broad, black, transverse band of upper side of abdomen is a most noticeable feature, as well as the entirely red costa of all wings beneath."

Mr. Strecker speaks afterwards of receiving additional specimens from the same locality. I have seen specimens which I believe to be this species, and judging from these and from Mr. Strecker's well executed figure, it is merely a form of *diffinis.* So, too, Mr. Maassen refers the species.

H. tenuis Grt., Buff. Bull. i, 4, pl. i, fig. 6, *Hemaris;* id. ii, 146, 147, *Hemaris;* Fish., Can. Ent. xvi, 143; Grt.,* Psyche ii, 66; Fernald, Sphing. 14, *Hemaris;* Holland,* Can. Ent. xviii, 101; Grote, Hawk Moths 26, *Hemaris;* Grt., Can. Ent. 1887, 19, 79.

fumosa Strk., Lep. Rhop. et Het. 93, 1875, pl. xiii, fig. 3, *Macroglossa;* id. 140; Butl., Tr. Zool. Soc. Lond. ix, 518; Grt., Buff. Bull. ii, 146, 147, pr. syn.; Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 69, pr. syn.

Pale yellowish and black. The two bluish white lateral abdominal spots evident against the blackish hairs of the basal segments, which latter are dorsally yellow. Anal tuft black, divided by yellow central hairs. Beneath, some sparse yellow hair overlies the usual abdominal vestiture. Legs black; pectus pale yellowish white; palpi above black, beneath pale yellowish. Wings largely vitreous, with very narrow, dull blackish borders; blackish at base as usual, and partially overlaid with yellowish scales. Costal edging narrow; the band along external margin is even on its inner edge and narrower throughout than in any species described from the Atlantic district. There is no perceptible red apical shading; the body squammation is rather rough; the external margins of the wings are more rounded and full than in most other species of the genus. Expands 1.50—1.70 inches; 37—42 mm.

Hab.—Eastern United States.

In Buff. Bull. ii, 145, Mr. Grote again speaks of the species, and says that in a series of imagines seen the characters are inconstant, except in the form of the outer marginal band. The apical stain is sometimes prominently present.

Mr. Strecker's species was based on fresh specimens which had the vitreous space clothed with scales. Most of the species when first from the pupa have this slight coating of scales, which is generally lost with the first flutter of the wings; in this species they adhere much more strongly than usual and specimens may be taken afield with the vitreous space opaque with scales.

Mr. Grote (l. c.) also says that compared with *diffinis* the larva of *tenuis* has the ventral stripe much more distinct and well defined. The general color is green, but a few brown specimens are found.

* The star wherever used to an authority indicates that the author describes the early stages, or some of them.

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H. marginalis Grt., Buff. Bull. i, 6, pl. 1, fig. 10, *Hemaris;* id. ii, 147, *Hemaris;* Jewett,* Bkln. Bull. iv, 17, life history; Pilate, Pap. ii, 66; Butl., Tr. Zool. Soc. Lond. ix, 521, *Hemaris;* Grt., Hawk Moths 26, *Hemaris;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 51. = *axillaris.*

axillaris ‡ Strk., Lep. Rhop. et Het. 140.

Thorax above yellowish shading to olivaceous, the squammation becoming deep yellowish over the basal abdominal segments dorsally. Middle abdominal segments black; the two pre-anal deep yellowish. Anal tuft black, with central yellowish hairs; beneath, the abdomen is black, the yellowish hairs of the pre-anal segments extending downwardly at the sides. Legs black; anterior with pale scales along the tarsi and tibiæ inwardly. Thorax beneath sulphur white; the body seems narrower, more fusiform than in the other species, and the squammation more depressed. Wings largely vitreous, ornamented as usual, but with a wider terminal band on the primaries than is possessed by *H. diffinis.* The inner edge of the marginal band is plainly dentate inwardly on the superior interspaces, There is a reddish apical stain as in *H. diffinis.* Expands 1.65—1.70 inches; 41—43 mm.

Hab.—Michigan, Ohio, Texas.

A very complete life history is given by Dr. Jewett in Bull. Bkln. Ent. Soc. vol. iv, p. 17.

H. axillaris G. & R., Tr. A. E. Soc. i, 23, *Sesia;* id. ii, 180, *Sesia;* Grt., Buff. Bull. i, 6. pl. 1, fig. 9, *Hemaris;* id. ii, 147, *Hemaris;* Butl., Tr. Zool. Soc. Lond. ix, 521, *Hemaris;* Grt., Hawk Moths 26, *Hemaris.*

grotei Butl., Ann. and Mag. N. H. ser. 4, v, xiv, p. 365, *Sesia;* Tr. Zool. Soc. Lond. ix, 521, pr. syn.

Size rather large, form stout; black. Head and thoracic region above, obscure yellowish olivaceous; this color extends over the basal segments of the abdomen. Antennæ and legs black. Labial palpi beneath and under thoracic surface, pale yellowish white. At the sides behind the eyes, are linear black shades. Eyes narrowly edged above with white scales; above, the palpi are black. Abdomen black, except at base as above noted; the two pre-anal segments are yellowish, this color extending over the sides, but not obtaining centrally beneath. Anal tuft black; in one specimen mixed centrally with olivaceous hairs. Wings largely vitreous; primaries with a very oblique yet rounded outer margin. Anterior wings with an obscure brown costal edging and brown at base, where they show a few olivaceous scales. The discal cell is free; a terminal, very broad brown band, tapering to internal angle and very strongly dentate on the interspaces within. The apical and two succeeding nervular interspaces are shaded with red scales within, from the apex downwardly and inwardly obliquely, in such a manner that the border on the apical interspace is almost wholly red, while on the two succeeding interspaces the red scales merely touch the toothed edge of the border. Secondaries largely vitreous; an even, narrow, brown terminal border, regularly and shortly dentate on the middle of the interspaces. Base of the wing and internal margin fuscous or blackish. The fuscous basal scales extend along costa very narrowly towards the apices. Five nervules are clearly exposed on the pellucid field of the wing. Beneath as above, the external borders tinged with reddish. Expanse 2.10 inches; 52 mm.

Hab.—Texas.

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The above is the characterization given by the describers of the species. They add: "At once distinguished from *S. diffinis* by the greatly broader band on the external margin of primaries, which is dentate on the interspaces. The form is stouter and the head wider across the vertex than in *S. diffinis*."

Afterward Mr. Grote states that the species is very similar to *marginalis*, but is larger, more robust, the marginal band much wider and more strongly dentate.

Mr. Strecker says: "These two [*axillaris* and *marginalis*] are unquestionably the same species; the type of *marginalis* has the dentations on inner edge of margin of primaries not as deeply cut as in the type of *axillaris*, but in a number of examples all the gradations between the two extremities can be found, and in one example which I possess the teeth are inwardly dentate, even more than in Grote's figure in Bull. Buff."

I believe that Mr. Strecker is right. There is nothing but a general unlikeness between the two species, which disappears when a number of specimens come under observation. I have seen specimens which agree as well with one as with the other.

H. diffinis Bd., Sp. Gen. i, pl. 15, fig. 2, *Macroglossa;* Harris, Sill. Journ. 36, 308, *Sesia;* Wlk., C. B. M. Lep. Het. viii, 81, *Sesia;* Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 129, *Sesia;* Morris, Synopsis 1862, 148, *Sesia;* Harris, Inj. Ins. Flint ed. 328, *Sesia;* Mead,* Can. Ent. ii, 157; Grt., Buff. Bull. i, 5, pl. 1, fig. 8, *Hemaris;* id. ii, 147, *Hemaris;* Lint.,* Ent. Cont. i, 40, *Sesia;* id. ii, 157; Bd., Sp. Lep. Het. i, 366, *Macroglossa;* Fernald,* Sphing. 14, *Hemaris;* Grt., Hawk Moths 26, *Hemaris;* Can. Ent. 1887, xix. 79, *Hemaris.*

fuciformis ‡ Sm. Abb. Ins. Ga. i, p. 85, pl. 43; Wlk., C. B. M. Lep. Het. viii, 81, pr. syn.

Head above and thorax anteriorly olive green, inclining to yellowish on the sides. A broad band of brown, bordered on each side with pale yellow, extends along the top of the thorax and abdomen. Upper side of the palpi, legs and under side of thorax and abdomen black, marked with pale yellow on the under side of the palpi; sides of thorax beneath the wings, front of the fore coxæ, a few hairs on the fore femora and on the middle and hind tibiæ, also on the sides of the middle segments of the abdomen, yellow. The lateral tufts at the end of the abdomen are black, while the central one is pale brown. There are a few blue scales on the hinder edge of the sides of the first two abdominal segments. The primaries are transparent, with dark brown veins and have a narrow, dark brownish opaque border along the costa; a similar one on the outer margin, interspaceally roundedly exserted on the inner side, widest at apex, where there is a rust-red apical spot. There is also a brown patch on the base of the wing with a narrow prolongation along the hinder border. The secondaries are transparent, with dark brown veins, a narrow outer border and a broad inner one

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which extends around on the costa, where it grows narrower as it extends outward; the borders are dark brown and opaque and marked more or less with rusty-red. Expands 1.70—1.90 inches; 43—48 mm.

Hab.—Canada, Hudson Bay Territory, Maine to Georgia, westward to Missouri, Iowa.

This is one of our more common species of the East, and there are southwardly at least two broods annually. It extends further North than most other species. It has been taken in New York in May and again in July, fresh specimens in each instance. Mr. Lintner says it is essentially a day flyer, and he has never taken it at dusk. It was usually on *Lupinus perennis*.

Among the specimens in Mr. Lintner's collection which I examined were many varieties in the amount of yellow on the abdomen, some with very distinct bands and some without any bands whatever. A form of the latter, in which the red stains are very strongly marked, must have furnished the type of Mr. Strecker's *æthra*.

In the "Canadian Entomologist" for April, 1887, vol. xix, p. 79, Mr. Grote, in a rambling note on this species, mentions nearly all the American forms without adding anything new save a speculation on the probable origin of the species.

H. gracilis G. & R., Pr. Ent. Soc. Phil. v, 174, pl. 3, figs. 1 and 2, *Hæmorrhagia;* Grt., Buff. Bull. i, 8, *Chamæsesia;* id. 18, *Hæmorrhagia;* Beth. Can. Ent. i, 10; Lint., Ent. Cont. i, 40, *Sesia;* Bd., Sp. Gen. Het. i, 371, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 522, *Hemaris;* Grt., Buff. Bull. iii, 220, *Chamæsesia;* Fernald, Sphing. 161, *Hemaris;* Grt., Hawk Moths 27, *Chamæsesia.*

ruficaudis ‡ Wlk. C. B. M. Lep. Het. viii, 82, *Sesia;* G. & R., Pr. E. S. Ph. v, 149, 175, pr. syn.

Male.—Form somewhat small and slight. Head and thorax above, clothed with olive green appressed hair; basal abdominal segments above similarly colored. Palpi black at the tips, whitish beneath. Orbits of eyes white; in front of these a few whitish scales. Laterally, the under thoracic parts are clothed with long white hair extending from behind the eyes to base of secondaries. Centrally, the under thoracic parts are clothed with long white hair, which is separated from the lateral white hair by two sublateral broad stripes of long reddish hair; a character which is very distinctive when we compare it with the concolorous pectus of allied species. Anterior femora clothed with thick white hair. Anterior tibiæ pale red, as are also the middle and posterior legs, both femora, tibiæ and tarsi. Abdomen, except basal segments above, dark red; third basal segment fringed anteriorly with pale hairs; fourth dorsally, with a few similarly colored appressed hairs; fifth and sixth with a few pale lateral hairs. Anal tuft black laterally, centrally pale red; under surface of abdomen pale red, with a central subobsolete series of pale spots composed of aggregated hairs. Laterally, spots of similar pale hairs at the base of the segments; the sides of the abdomen show subtufts fringed above with pale yellowish, similarly colored

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hair to that forming the lateral and central series of abdominal spots; anal tuft concolorous with abdomen beneath; extremities of anal hairs black. Wings vitreous, anterior pair largely bright red at base, the scales encroaching on the discal cell from the base; a narrow cross bar at end of cell; discal cell free. External margin with a moderately broad, dark red, even band, narrowing to internal angle, not dentate on the interspaces. Costa and internal margin bordered somewhat narrowly with dark red scales; posterior wings bright red at base and over anal angle; external margin with an even border of dark red scales. Centrally, the secondaries are vitreous, the diaphanous field crossed by five nervules; under surface resembling upper, the red color of the primaries is a little brighter, especially along costa and at apices, when compared with the color of these parts on the upper surface. The posterior wings are distinctly shaded with pale yellowish over and within anal angle on the interspaces inside of the external border. Expands 1.75 inches.

Hab.—Canada, Maine, Massachusetts, New York, Eastern and Middle States.

There is no perceptible difference between the sexes. The species appears in June and July, and as far as I am aware the early stages are not described.

This species, Messrs. Grote & Robinson say, while presenting too many points of difference to be *ruficaudis* Kirby, is evidently the form described as *ruficaudis* by Mr. Walker. Mr. Butler explains that while one specimen of *gracilis* was placed by Mr. Walker among the examples of *ruficaudis*, yet the Walkerian type is Kirby's species. He further says that *gracilis* may at once be distinguished from even the most similar examples of *H. ruficaudis* (Kirby?) Walker, by the straight inner edge of the external brown band of primaries, the more heavily scaled discocellulars and the smaller hyaline patch on the secondaries.

The species is not uncommon and seems very constant, except that quite often six veins are very distinctly visible in the vitreous field of secondaries. At least half of the specimens in Mr. Lintner's collection examined by himself and myself proved to have six distinct veins. There could be no doubt as to the species.

H. thysbe Fabr., Syst. Ent. 548, *Sesia;* Sp. Ins. ii, 155, *Sphinx;* Mant. Ins. ii, 99, *Sesia;* Ent. Syst. iii, 1, 381, *Sesia;* Gmel. ed. Linn. S. N. 2, 388, *Sesia;* Wlk., C. B. M. Lep. Het. viii, 82, *Sesia;* Clem., Journ. Ac. N. S. Phil. iv, 1859, 129, *Sesia;* Morr., Syn. Lep. 1862, 149, *Sesia;* Lint.,* Pr. E. S. Phil. iii, 646, *Sesia;* G. & R., Pr. E. S. Ph. v, 150, *Hæmorrhagia;* Lint., Ent. Cont. i, 40, *Sesia;* Grt., Buff. Bull. i, 8, *Hæmorrhagia;* Beth., Can. Ent. i, 10, *Hæmorrhagia;* Bd., Sp. Gen. Het. i, 369, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 521, *Hemaris;* Hulst,* Bkln. Bull. ii, 38, *Macroglossa;* Pilate, Pap. ii, 67; Fernald,* Sphing. 16, *Hemaris;* Holland, Can. Ent. xviii, 102; Grt., Hawk Moths, 27, *Hæmorrhagia.*

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pelasgus Cram., Lep. Ex. iii, 93. pl. 248, fig. B, *Sphinx;* Hüb., Verz. 131, *Cephanodes;* Harr., Sill. Journ. 36, 308, *Sesia;* Wlk., C. M. B. Lep. Het. viii, 82, pr. syn.; Harr., Inj. Ins. Flint. ed. 328, fig. 156, *Sesia;* Morris, l. c. in note, pr. syn.

cimbiciformis Steph., Ill. Br. Ent. Haust. i, 135, *Sesia;* Wood, Ind. Ent. pl. 53, fig. 29, *Sesia;* Wlk., C. B. M. Lep. Het. viii, 82. pr. syn.

Var. UNIFORMIS G. & R., Tr. Am. Ent. Soc. ii, 181, *Sesia;* id. List. Lep. 1868, *Hæmorrhagia;* Lint., 23d Rep. N. Y. State Cat. N. H. 172, *Sesia;* Ent. Cont. i, 40 = *ruficaudis;* Grt., Buff. Bull. i, 8, *Hæmorrhagia;* id. ii, 224; Strk., Lep. Rhop. et Het. 1876, 109, *Macroglossa* = *ruficaudis;* Grt., New List 1882, var. *thysbe;* Edw., Papilio, iii. 125; Holland, Can. Ent. xviii, 102, *Hemaris;* Grt., Hawk Moths 27, an dim. form. pr.

Var. FLORIDENSIS G. & R. Ann. Lyc. N. H. viii, 439, pl. 16, fig. 20, *Hæmorrhagia;* Grt., Buff. Bull. i, 8, *Hæmorrhagia;* Butl., Tr. Zool. Soc. Lond. ix, 522, *Hemaris;* Hulst, Bull. Bkln. Ent. Soc. ii, 40, pr. syn.; Grt., New List an var. pr.

The upper side of the head, palpi and thorax is of a bright olive green color. The sides of the palpi are blackish, and they are cream colored beneath; the breast and legs, except the hind tarsi and lower ends of the tibiæ which are brown, are also cream colored; the upper side of the abdomen has the first two segments yellowish-brown, the next two deep reddish-brown or blackish, and the terminal segments yellowish-brown with reddish-brown in the middle and black on the sides. The primaries have a narrow costal border, a wide outer border dentate inwardly on the interspaces and a basal patch extending along the hinder margin of a dark reddish-brown color and overlaid on the basal portion with olive-green hairs. The cell is divided through the middle by a longitudinal line of brown scales. Secondaries bordered all around, narrowly on costa, more widely on outer margin, with dark reddish-brown, while the hinder margin and base of the wing have a very wide border of rust-red. All these borders are lighter on the under side of the wings. Expands 2 inches; 50 mm.

Hab.—Labrador, Canada; Southward to Florida; Westward to the Mississippi.

This is the description of the type form.

In Trans. Am. Ent. Soc. ii, 182, Grote & Robinson says: "As *Sesia thysbe* var. *uniformis*, we would record the *Sesia ruficaudis* of Mr. Walker. This is not Kirby's species to judge from the description of that author. This is a form of *S. thysbe*, occurring in both sexes, in which the external border of the primaries is not dentate inwardly on the interspaces. We formerly regarded this as the usual female form of *S. thysbe*, but with more material we correct this opinion. In *S. thysbe*, both ♂ and ♀ have the external marginal border of the primaries dentate on the interspaces within."

Later they separate *uniformis* as a good species. Mr. Lintner gives a very good description of the larva of this form in Proc. Ent.

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Soc. Phil. iii, 646, from which the following is taken in order to present fully the differences supposed to exist between this and other species hereafter mentioned.

Length 1.75 inches. Head elliptical, granulated, dull green, when at rest partially buried within the first segment. Mandibles yellow, black tipped. Body tapering anteriorly from the seventh segment, clear green, lighter dorsally, shading darker to the stigmata, below which to the prolegs it is of a uniform darker hue; underneath, from the third pair of legs to the terminal pair, dull rose, bordered externally by a buff stripe, continued to the sixth segment and inflated above the prolegs. First segment carinated on its anterior margin superiorly, upon which are about sixteen light yellow granulations. Collar studded with smaller, light green granulations; vascular stripe bordered by two white lines, commencing on the second segment, becoming wider and more distinct on the central segments and uniting anterior to the base of the caudal horn; a white, sometimes yellow green subdorsal line, commencing on the second segment, running midway between the stigmata and dorsum and terminating in the sides of the caudal horn, made up of a white spot on each annulation, except on the smooth eleventh segment, where it is continuous; white ocellations on the annulations above the stigmata. Stigmata red, with a white dot at each extremity. Caudal horn .2 inch. in length, curved, light blue, yellow tipped, granulated with white laterally, with black anteriorly and a few granulations posteriorly; caudal shield and plates granulated like the collar. Legs, basal joint black, tipped. Prolegs green, with a fusiform black spot exteriorly. In readiness for pupation the larva changes as follows: Head purple; the granulations of the first segment ochre yellow; between the subdorsal lines purple or reddish brown; laterally and ventrally pea green. Forms a slight cocoon among the leaves on the ground. Pupa 1—1.10 inches in length, broadest at about the middle, tapering thence regularly to the extremities; entire surface shagreened; color brownish black, with reddish brown on the movable segments posteriorly—and anterior to the stigmata, prominent transverse wrinkles—showing only when the segments are bent on one side, as they usually are, to such a degree as to bring the terminal spine at nearly a right angle with the central segments. Segments 3-8 inclusive, prominently ridged transversely. Head case produced, subtriangular anteriorly. Antennæ cases terminating midway between the tips of the middle and posterior leg-cases in the ♀. Tongue case buried. Stigmata brown, oval; terminal spine broad at base, prominent, flat, rounded towards the tip, showing under a lens a marginal row of about ten delicate curved reflected spines on each side and a larger terminal double hook, by which the pupa is attached to some transverse threads in its cocoon.

Feeds on the Snow ball (*Viburnum opulus*) the imago emerging early in May.

Mr. Hulst gives a somewhat different description in Bull. Bkln. Ent. Soc. ii, 38; according to him:

"The mature larva has the head deep green, large, closely sessile upon the body. The head is partly retractile beneath the first segment of the body. The body is nearly cylindrical, enlarging moderately from the first to the fourth segments. The first segment has a collar above, which is edged with yellow and

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under which the head may be partly retracted. There is a subdorsal line extending from the head to the caudal horn—up to maturity it is yellowish, then becomes pale white. There is also an indistinct line of yellowish changing to white. The ground color of the body below the subdorsal line is clear deep green, above a blue green, deeper bluish toward dorsal line. Spiracles red spots with a yellow dot above and below. Fore legs red, the others vitreous, capped on outside with black, that with yellow. Body beneath pink between tenth and last segments. Caudal horn prominent, stout, curved backward, light blue in color with yellow and pink point. Larvæ varying from 30 to 50 mm. in length."

"There is much difference in the amount of red markings upon the larvæ. Some few are suffused with a crimson shade, and many are strongly marked with red forming dorsal and lateral stripes."

The eggs were deposited May 31st by a specimen of *H. uniformis*. They are generally deposited singly on the under side of leaves of *Viburnum lentago* (Sheep berry), but in one instance Mr. Hulst says he found ten eggs on the under side of one leaf. The larvæ appeared June 7th; first moult June 11–12; second moult June 13–14; third moult June 16–17; fourth moult June 21–22. They left their food plant and began making cocoon June 29th. They pupated two days later, and emerged July 15th as *H. thysbe*. That is, from eggs laid by *H. uniformis* were obtained imagos of *H. thysbe*.

Mr. Hulst says that there is not much difference in maculation throughout the life of the larva and that the cocoon is thin and parchment like.

H. FLORIDENSIS is described in Ann. Lyc. N. H., N. Y. viii, 439, as follows:

"Form stout. Head above, dark olive green. Palpi projected beyond the front, approximate at their tips; above, blackish; beneath, with under thoracic surface, clear yellowish white. Legs, generally finely scaled; anterior pair outwardly clothed with whitish scales; inwardly, the tegument is almost naked, blackish and dusted with ferruginous atoms. Middle pair with the femora clothed with yellowish white hair outwardly; inwardly blackish, naked; tarsi shading to blackish towards the extremities. Hind tarsi and the basal portion of the tibial hairs black; inwardly, the tarsi are obsoletely shaded with pale hairs. Thorax above entirely dark olive green, which color extends over the two basal segments of the abdomen above. Next four segments above very deep red, fringed sparsely anteriorly by short white hairs, which are easily removed by attrition, appressed. Fifth and sixth segments with olive green lateral shades. The fifth and sixth, and the anal segment of the male show yellowish white subtufts at the sides. Anal tuft reddish in the middle, where the hairs are longest; black at the sides; underneath, entirely bright red, where the hairs are more thinly spread out and shorter than above, allowing the lower black surface of the superior tuft to be seen; under surface of abdomen bright red; terminally a few yellowish white hairs, gathered on anal and pre-anal segments into small, medial

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subtufts. Antennæ black, rather massive. Anterior wings with the costa, subsinuate, rounded at base, medially depressed, rising again to apices; external margin very oblique; internal angle prominent. At extreme base these are covered with olive green hairs; beyond, dark red; costa and internal margin bordered with dark red scales; centrally, the pellucid tegument acquires, in certain lights, a blue reflection. The terminal band is obscure dark red, with its inner margin sinuate, not dentate on the interspaces. The discal cell retired towards the base of wing, is nearly filled with dark red scales and but partially hyaline, but sufficiently so as to allow a distinct longitudinal bar to be seen, traversing the cell, appearing at the inward prolongation of first median nervule. Under surface bright red, much paler than upper surface; terminally, the band is of an obscure tint, but along costa and over apical interspaces the color is brighter. Internal margin bordered with paler, somewhat ochreous red scales, as is also the extreme base of the wing. Secondaries above bright red, largely vitreous; the hyaline space crossed by six nervules. The narrow terminal band, along external margin, is deep red, shading to bright red over anal angle and the base of the wing; under surface bright red, paler than upper surface: at extreme base some ochreous and yellowish white scales. Expands ♂ 2.40 inches.

Hab.—Florida.

In the "New Check List" Mr. Grote places this as a variety of *thysbe*, but later retracts this opinion and again claims specific distinctness for it.

Macroglossa etolus Bd., Sp. Gen. Lep. Het. i, 370; Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 69 = *thysbe*.

A free translation of Boisduval's description is as follows: We have never seen this species; our description is made after a fine drawing which we received from John LeConte.

This *Macroglossa* is near the size and shape of *thysbe*, but it has a little the habitus of *bombyliformis*. The primaries are brown, with a transverse band, oblique, transparent, cut by the nervures, sinuate at its anterior margin and dentate at the side which looks to the base of the wing.

The secondaries are largely ferruginous at the base, marked a little beyond the middle with an oblong, rounded, transparent patch cut by the nervures; the border is brown.

The head, thorax and abdomen are of an olive green; the latter is marked a little beyond the middle with two brown segments, of which the latter is joined by a spot of the same color which is prolonged to the beginning of the anal brush. This latter is reddish, cut with two fascicles of black hair. We have nothing to say of the under side.

This is *thysbe* without any doubt. The description fits some specimens perfectly and fits nothing else. The description being made

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from a figure should have no standing anyway. I find that Maassen also says that this is the Southern form of *thysbe*.

H. ruficaudis Kirby, Fn. Bor. Am. iv, 303, *Sesia;* Wlk., C. B. M. Lep. Het. viii, 82, *Sesia* = thysbe; Clem. Journ. Ac. N. Sci. Ph. iv, 129 = *thysbe;* Morr., Synopsis 1862, 149. *Sesia;* G. & R., Pr. E. S. Ph. v, 149, 175, *Hæmorrhagia;* Tr. A. E. S. ii, 181 = *thysbe;* Grt., Buff. Bull. i, 19.? = *thysbe;* Couper, Can. Ent. iv, 205, *Sesia;* Bd., Sp. Gen. Het. i, 371, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 521, *Hemaris;* Strk., Lep. 109, pl. xiii, fig. 1 ♂; id. 140 = *uniformis;* Hulst, Bull. B. E. Soc. ii, 40 = *thysbe;* Grt., Can. Ent. ix, 131; Beth., Can. Ent. xi, 152, *Sesia;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 51 = *thysbe.*

Kirby's description is as follows: "The body yellow olive, underneath pale yellow. Antennæ black; primaries reddish brown, hyaline part half divided towards the base, with a costal bar, covered with yellow olive hairs at the base; underneath the costa, the posterior margin and the nervures are dark ferruginous; there is also a yellow stripe on the inner side of the base; secondaries hyaline in the disc; base externally and costa yellow; internally the base is ferruginous; underneath the dark part of the wing is ferruginous and the base parts yellow; two first segments of the body yellow olive, two next black, the rest ferruginous with pale lateral spots. This species appears to be the American representative of *Sesia fuciformis*, which it greatly resembles, but differs in the color of the tail and the base of the secondaries."

H. pyramus Bd., Sp. Gen. Sp. Gen. Lep. Het. i, 372, *Macroglossa.*

The following is a translation of Boisduval's description: It is a little larger than our *bombyliformis*, of which it has the habitus. The four wings are transparent, cut with black on the nervures as in the other species of the same group; the primaries have the base black with olivaceous hair; the border is moderate, ferruginous brown; it has in addition, an oblique patch of the same color at the end of the cell.

The secondaries are largely ferruginous at the inner margin, the outer border is straight and blackish brown.

The thorax is olive green, as is the abdomen; the latter is traversed at the middle with two black segments, of which the latter is joined posteriorly by a dorsal spot of the same color; the anal tuft is olive green above, laterally bordered with black.

Beneath, the contour of the wings is rust red, with the breast and palpi white; the belly is ferruginous and with very small fascicles of yellow hair at the incisions. It lives in the Northern United States.

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The larva, according to John LeConte, is found at two periods,—in June and in September, on *Viburnum* and other shrubs of the *Caprifoliaciæ*. We have not a figure of it. It seems to us a near neighbor of *ruficaudis* of Kirby.

Mr. Grote says this is probably *uniformis*, and I think he is correct.

H. buffaloensis G. & R., Ann. Lyc. N. H. N. Y. viii, 437, pl. 16, figs. 18-19, *Hæmorrhagia;* Grt., Buff. Bull. i, 8, 18, *Hæmorrhagia;* id. ii, 224; Lint.,* Ent. Cont. i, 40, *Sesia;* id. ii, 112; Strk., Lep. Rhop. et Het. 109 = *ruficaudis*; Butl., Tr. Zool. Soc. Lond. ix, 522 = *ruficaudis;* Grt., Can. Ent. ix, 131, an sp. dist.; Hulst,* Bkln. Bull. ii, 40 = *thysbe;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 51 = *thysbe;* Grt., Hawk Moths 27, *Hæmorrhagia.*

Head above, dark green; palpi prominently scaled, converging to the tips, which prominently exceed the front, blackish above and laterally, beneath with the entire under thoracic surface pale yellowish white; eyes margined below with pure white scales; maxillæ well developed, blackish; antennæ rather stout and long, tapering to base, serrate outwardly, with a short attenuate terminal hooklet. Thorax above bright green, becoming somewhat discolorous, tinged with ochreous posteriorly. Basal segments of the abdomen above pale ochreous; third and fourth entirely deep red; terminal segments olivaceous, shaded medially by patches of the same color; anal segment provided with an ample tuft; laterally, at base, a few ochreous hairs; beyond, on each side, the anal hairs are largely black, the longer lateral scales from beneath fringe these black lateral portions of the tuft, which are also somewhat folded towards each other terminally; medially the anal tuft is obscure reddish, tipped with black; inferiorly rust red. In the female the anal tuft is narrower, pointed, beneath black, red at base; above dull reddish tipped with blackish. Abdomen beneath dull ferruginous or rusty red. The pre-anal segment shows medially a few white scales; laterally longer, pale ochreous hairs converge inwardly from the margins of the segments. Anterior coxæ thickly clothed with pale yellow hair, concolorous with under thoracic surface. Legs slender, finely scaled; anterior femora, tibiæ and tarsi obscure pale ferruginous or red inwardly, outwardly pale yellowish white; middle femora and tibiæ entirely pale whitish, with a dark discolored dot at the joint above; tarsi ferruginous, paler towards the base. Posterior legs with the femora and tibiæ pale yellowish white; tarsi and base of the tibiæ dark ferruginous or red; tibial spurs rather feeble, pale colored. Anterior wings narrow, much produced at apices, short along internal margin, dark claret brown covered at base with bright green scales; discal cell narrow, brought near to the base of the wing, traversed longitudinally by a bar of scales. The costa is narrowly covered with ferruginous scales from just beyond base to apex. Centre of the wing taken up by an oblique vitreous space, free from scales, much as in *H. thysbe*. A terminal brown marginal band narrowing to internal angle, its inner margin sinuous, *not* dentate on the interspaces. On internal margin, below the vitreous space, a few scattered pale scales. Secondaries smaller, but quite similar to those of *H. thysbe* in general coloration and appearance; the vitreous space crossed by six nervures; under surface resembling upper, dull rusty red, with a few pale scales at extreme base. Expanse 1.65—1.80 inches.

Hab.—New York, Canada, Northern United States.

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A series of specimens examined by me shows very little variation. Except in the smaller size and consequent smaller vitreous spaces I could distinguish no difference from *uniformis*.

Mr. Lintner has given us a very good life history of this species in the Ent. Cont. ii, 112, which I reproduce in nearly his own words for comparison with the description of H. *thysbe:*

Egg on *Viburnum opulus* (Snow ball) in August; nearly round, smooth and of a pale green color.

Young larva of a uniform whitish green, with a straight, dark brown caudal horn. The *first moult* occurred August 24th; length .15 inch, of a uniform pale green. Body under a lens showing a number of delicate hairs. Caudal horn brown, smooth and straight. When ready for the change it was .32 inch. in length. *Second moult* August 30th; length .35 inch. in length. Head uniform pale green, with short, fine whitish hairs. Body slightly hairy, pale green, with a lateral stripe of yellow green; segments with a yellow green dot in front on each side of the vascular line and a few smaller ones on the posterior half. Caudal horn straight, nearly cylindrical, light red, striped anteriorly near the base and tipped with brown, and spotted with brown intermediately; borne at an angle of about 40°. *Third moult* six days later; length .5 inch. Head granulated. Collar bordered anteriorly with about twelve small tubercles. Body minutely papillose, else as before. Caudal horn light red, regularly tapering from base to tip, covered with spinules which anteriorly and posteriorly have black bases. Stigmata deep orange, with a yellow green dot at each end; those of the prolegs bearing segments bordered before with a deep orange line. Legs at base marked with black; prolegs on the outer side and body beneath on the last two segments pale red. *Fourth moult* sixth days later; length .65 inch. Head green, its surface appearing shagreened under a lens, marked with indistinct lateral stripes and dotted with whitish granulations which diminish in size toward the centre; mandibles yellow, black tipped; eyes on a fuscous crescent. Collar with whitish granulations, except on the anterior margin, where they are orange. Body greenish white dorsally, with a vascular line of rose pink interrupted at the incisures; a lateral stripe of yellow green papillæ of one to each annulet, edged above with darker green and below with green shading deeper to the prolegs; lateral papillæ greenish yellow; ventrally, from the fourth segment to the posterior extremity, concolorous with the vascular stripe. Caudal horn curved, rose colored, tipped with ferruginous, with fuscous spinules anteriorly and posteriorly. Stigmata crimson, white dotted at the extremities and surrounded with rose. Legs and prolegs ferruginous basally, next fuscous and rufous terminally. As the larva approaches maturity it becomes more white dorsally, the red of the vascular stripe changes to white and the red surrounding the stigmata disappears. With the distension of the skin the papillæ change to whitish ocellations.

The larva makes a slight cocoon of bronze brown silk, so loose that the pupa is visible through the meshes. The pupa is of a chestnut color with testaceous at the incisures. The imagos emerged in April and had the "vitreous spot" of each wing thinly covered with scales.

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H. fuscicaudis Bd., in Wlk. C. B. M. Lep. Het. viii, 83, *Sesia;* Clem., Jour. Ac. N. Sci. Ph. iv, 1859, 130, *Sesia;* Morris, Synopsis 1862, 150, *Sesia;* G. & R., Pr. E. S. Phil. v, 150, *Hæmorrhagia;* Grt., Buff. Bull. i, 8, 19, *Hæmorrhagia;* Bd., Sp. Gen. Het. i, 373, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 522, *Hemaris;* Strk., Lep. Rhop. et Het. 140 = *thysbe:* Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 51 = *thysbe.*

Of this species Boisduval says: "At first glance one would take it for *pyramus*, but it is well distinguished by the following characters: The last five segments of the abdomen and the anal brush are red brown; 2d, the brown color above is separated from the olive by a transverse line of pure white; 3d, the base of primaries is as in *thysbe*, much more largely black, so that this color absorbs the little transverse ray at the end of the cell. From a unique example in the British Museum from Georgia."

Grote & Robinson, in Ann. Lyc. viii, say that the species is unknown to them, but they "have examined a drawing of this species made under the superintendance of Mr. Walker, which shows it to be much nearer allied to *thysbe* than the present species, [*floridensis*] since it is slenderer and shows the inner margin of the terminal band of the primaries to be plainly dentate as in *H. thysbe*, while the absence of the olivaceous lateral shades on the terminal abdominal segments is the only prominent character which distinguishes Mr. Walker's *S. fuscicaudis* from Fabricius' species, to judge from the brief diagnosis of the former given in the British Museum Lists."

In Buff. Bull. i, Mr. Grote suggests that this may be only a form of *thysbe*. In his New List he places it as a good species, elsewhere stating that he does not positively know it.

The synonymy and the various notes under the species from *thysbe* to *fuscicaudis* have made it sufficiently clear that it is extremely uncertain what rank these forms have. Whether we have one variable form *thysbe*, or else a number of closely allied species. Mr. Grote holds that there are a number of allied species. His synonymy is THYSBE, var. UNIFORMIS = *ruficaudis*, var. FLORIDENSIS, BUFFALOENSIS, FUSCICAUDIS.

Mr. Strecker, in his various papers, has expressed himself in no uncertain terms as to the specific standing of the forms.

His notion seems to be that we have two forms,—*thysbe*, of which *fuscicaudis* is the Southern form differing in nothing except its greater size. The slight differences in color pointed out by Mr. Butler (hereinafter cited) are regarded as evanescent; *floridensis*, Mr. Strecker would undoubtedly refer to the following species, *ruficaudis*,

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with *buffaloensis* and *uniformis* as synonyms. Mr. Strecker's idea has this in its favor, that it associates the forms with similar outer margin, while Mr. Grote's arrangement is inconsistent in that respect.

Boisduval's species are undoubtedly synonyms of some of these *thysbe* forms.

Mr. Butler, speaking of *ruficaudis* Kirby, says that he thinks Walker's identification correct, and considers this as the American representative of *H. fuciformis*, but in some respects more nearly allied to *H. floridensis* G. & R.

Of *H. buffaloensis*, he says it is closely allied to, if not identical with *H. ruficaudis;* the body, however, seems greener in coloring, and the cell of the primaries less open.

Of *H. floridensis*, again, he says it is allied to *fuscicaudis*, but with the external margin narrower and not dentated; in *H. fuscicaudis* it is much more strongly dentate than in *H. thysbe*.

Finally, Mr. Hulst raised *thysbe* from *uniformis*, settling the question of their identity. The size, he says, is subject to much variation, and the specimens are made large or small, or, in other words are made the forms *floridensis* or *uniformis*, almost if not quite at one's pleasure by different methods of rearing. Reared in a glass jar, with much moisture in the air, with high average temperature and with plenty of food, and the result is *floridensis;* reared in the open air, with neglect in food, and the result is *uniformis*. As it was, by rearing in the open air under practically the same circumstances, the spring form varied from 45 mm. to 56 mm. in expanse of wing. The *thysbe* form varied much less in expanse than did the other. The imagines of the *thysbe* form varied in the same brood in the depth of the dentations on the exterior band of the fore wings. One specimen was almost without dentations, and one had them reaching almost half way across the transparent space. In most before flight, the transparent costal spot was covered with scales so as to be entirely indiscernible. These were more or less lost upon flight, though more permanent than the scales at first covering the central transparent portion of the wings.

Mr. Hulst adds the following synonymy as the result of his studies:

MACROGLOSSA THYSBE Fabr.
" *pelasgus* Cramer.
" *cimbiciformis* Stephens.

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Dimorphic variety:

MACROGLOSSA RUFICAUDIS Kirby.
" *uniformis* G. & R.
" *buffaloensis* G. & R.
" *floridensis* G. & R.

Mr. Grote has always objected to including *buffaloensis* in this synonymy because the larva was different and as can be seen from the description there are differences, though apparently not greater than in other Sphingid larvæ.

Mr. Holland states that he considers *uniformis* the Northern form, and that he has never received it from south of the Potomac, and has never found it in West Virginia, North Carolina and southern Indiana.

Personally, after the examination of large series in all accessible collections, I believe we have to do with but a single species, and that with a really narrow range of variation. The difference in size is a very common one in this family, and the difference in the dentation of the outer band is an inconstant character. It is, of course, possible to separate out the varieties, but it is equally easy to run an uninterrupted series from one form to the other.

As to the Western species, which all belong to the *Hemaris*, or yellow section of the genus, it is impossible to venture any decided opinion. There seem to be too many names, but exactly what species fall together cannot yet be told with certainty.

I would arrange the species for the present thus:

Colors yellow and black, form plump.
Vestiture shaggy, thin, short, palpi small.
Black margin of primaries narrow, even.
Palpi orange; black tipped..... ..... **palpalis.**
Palpi yellow, black at sides and tip.
Abdomen with dorsum yellow or olivaceous at base, and pre-anal segments yellow, posterior tibia with a tuft of yellow hairs..**thetis.**
Abdomen more or less covered with yellow hairs over its entire surface; no colored hairs at base; red stains on primaries very prominent. **rubens.**
Abdomen black at base, only two pre-anal segments yellow; marginal band of primaries narrow; no brush of yellow hair to hind tibia. **cynoglossum.**
Vestiture longer, smooth, more closely appressed; palpi longer, forming an indistinct snout.
Terminal band of primaries even on its inner edge..... .....**tenuis.**
Terminal band of primaries roundedly exserted on its inner edge..**diffinis.**
Terminal band of primaries dentate on its inner edge..... .... **axillaris.**

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Colors olive and red brown; body more graceful and slender.
Discal cell of primaries free; vitreous field of secondaries usually crossed by five nervules.
Thorax beneath with lateral red shades; hind wings beneath with a pale shade at anal angle..... **gracilis.**
Discal cell of primaries crossed by a bar of scales; vitreous field of secondaries crossed by six nervules.
Inner margin of band of primaries inwardly dentate..... **thysbe.**
Inner margin of band of primaries not dentate.
Larger..... .....var. **ruficaudis.**
Smaller..... .....var. **buffaloensis.**

The synonymy will be given in the list at the end of this paper.

LEPISESIA Grt.

Pr. Ent. Soc. Phil. v, 38, 1865.

Head small, eyes small, more or less distinctly lashed; tongue moderate or long, corneous; palpi somewhat variable, usually short, rarely forming a short snout (*gaurœ*); body stout, sometimes more or less depressed; abdomen with inconspicuous lateral tufts, often wanting, and a more distinct anal tuft; posterior margins of segments spinulose. Feet moderate, anterior tibiæ stout, with a series of stout spines or claws outwardly and at tip. Primaries rather elongate, outer margin oblique, sinuate, hind angle distinct and somewhat produced. Secondaries somewhat variable in form, usually somewhat produced. The venation presents nothing peculiar. There is never any difficulty in recognizing this genus as the combination of clavate antennæ and armed fore tibiæ is found nowhere else.

Taken as a whole the genus is not a compact one. In Mr. Grote's List the species here united are divided among *Lepisesia, Euproserpinus* and *Pogocolon*, and at first sight the division seems justified. As, however, we get the species together and compare them more closely, it will be seen that the differences are hardly tangible, and that following the same line, *clarkiæ** is not congeneric with *gaurœ*, and, indeed, offers better characters for separation, while *terlooi* Hy. Edwards, certainly does not belong with its associates and probably furnishes an ally to *Arctonotus*. The species is Mexican, and I am at a loss to know why it stands in our catalogues, as it has never been recorded from this country.

* I find that Mr. Butler has made this the type of *Dieneces*.

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The type of *Lepisesia* is the New England *flavofasciata*, a rarity, differing in the somewhat stouter, shorter, more or less depressed body from the others. The wings have a semi-transparent fascia, which is yellow on the secondaries. The palpi are short, the front wide, and the secondaries narrow, the anal angle not produced. Its near ally, so far as the figure and description will admit of judgment, is *Macroglossa ulalume* Strk., which, besides some minor differences, has the semi-transparent fascia blackish and not yellow on the secondaries.

The type of *Euproserpinus* is the Californian species *E. phæton* G. & R., a shorter winged species, with more slender, scarcely depressed form, thin vestiture, and with the secondaries broader and somewhat produced anally, not, however, acutely so. The disc of secondaries is very pale whitish yellow. Close to this in structure of head, short palpi and thin vestiture is *Pogocolon clarkiæ* Bd. This has the typical ornamentation of *Pogocolon*—more or less olive green in color with a deeper central band—and the peculiar western shagginess so marked in some of the species of *Hemaris*. The secondaries have the anal angle scarcely marked. Intermediate between this and *gaurœ* is *P. circeæ* Hy. Edwards, an Eastern form resembling *clarkiæ* somewhat in wing form, but with the anal angle of secondaries much more distinct, larger also in size and with more dense vestiture, the palpi longer and more distinct.

At the extreme comes *P. gaurœ* with its variety *juanita* Strecker, differing from all the others in its larger size, acutely produced anal angle of secondaries and more prominent palpi, the latter forming a short pointed snout similar to that in some species of *Hemaris*. The vestiture is longer, thicker, more smoothly appressed and the habitus of the insect most nearly approaches that of *Deilephila*.

Of the species the genitalia of *clarkiæ* alone have been examined, and they have presented nothing of special note. They will be described under that species. In tabular form the scheme above developed would be as follows:

Primaries with a semi-diaphanous fascia.
  Secondaries with a yellow fascia ..... **flavofasciata.**
  Secondaries with fascia semi-diaphanous, blackish as on primaries. **ulalume.**
Primaries without semi-diaphanous fascia.
  Secondaries with disc very pale yellow ..... **phæton.**
  Secondaries orange or red.
    Vestiture thin, palpi short, size small ..... **clarkiæ.**
    Vestiture thicker, palpi longer, size larger ..... **circeæ.**
    Vestiture smooth, dense; palpi forming a short snout; size larger. **gaurœ.**

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L. flavofasciata Barnst. in Wlk. C. B. M. Lep. Het. viii, 87, *Macroglossa;* Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 131, *Macroglossa;* Morris. Syn. Lep. 151, *Macroglossa;* Grt., Pr. E. S. Phil. v, 39, *Lepisesia;* G. & R., Pr. E. S. Phil. v, 149–171, *Lepisesia;* Beth., Can. Ent. i, 10, *Lepisesia;* Bd., Sp. Gen. Lep. Het. i, 364, *Macroglossa;* Strk., Lep. Rhop. et Het. p. 110, pl. xiii, fig. 4, ♀, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 517, *Lepisesia;* Fernald, Sphing. 19, *Lepisesia;* Grt., Hawk Moths 27, *Lepisesia.*

Head and thorax above pale yellow, interspersed with a few black hairs. Laterally the orbits of the eyes and palpi black, the latter yellowish beneath. Abdomen black, with the first segment above and the side tufts on the last segment but one pale yellow; under side of the body and legs black. Primaries blackish, with a pale or whitish oblique band across the wing beyond the cell and crossed by the black veins. Discal spot small and black. Hind wings black, with a broad central band of bright orange yellow. Beneath the maculation of upper side reproduced, but paler, and the basal part of the primaries is bright orange yellow. Expands 1.60—1.75 inches; 40—46 mm.

Hab.—Hudson's Bay Territory, Canada, Maine, Massachusetts.

The specimens seen by me vary in the direction of a narrower basal paler transverse band on primaries. The species is extremely rare and flies in mid-day around flowers in June. Prof. Fernald says it appears to be one of their earliest day flying Sphinges. Few collections have more than one or two specimens of this species, and I have been unable to obtain any for dissection.

Nothing is known of the early stages.

L. ulalume Strk., Lep. Rhop. et Het. 135, pl. xv, fig. 3, ♂, *Macroglossa.*

"Male. Expands 1⅛ inches. Head above sulphur yellow, below black, antennæ black. Thorax on back black mixed sparingly with yellow hairs, patagiæ sulphur yellow, collar intense velvety black; beneath black; legs black. Abdomen above velvety black with sulphur yellow side tufts to the last two segments, anal brush black above, yellow beneath; underside of abdomen black. Upper surface of all wings blackish, darkest on basal half and at abdominal margin of secondaries; a common broad, semi-diaphanous band a shade or so paler than ground color crosses both wings, this band on the secondaries does not extend to inner margin and shows toward its inner extremity a few scattered, scarcely noticeable yellow scales. Under surface as above, dark color more dull; some loose orange hairs on basal part of primaries and the inner termination of the mesial band of secondaries is slightly clothed with sulphur colored scales."

"One ♂ from Oregon.

"This beautiful species is near to *M. flavofasciata* Barnston, but differs notably in the black collar and thorax, in the absence of the bright yellow mesial band of secondaries, as well as in its greater size."

Mr. Strecker's figure shows a remarkable species, entirely unlike anything thus far known to me. The figure expands nearly two

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inches and resembles, at first sight, *Hemaris* rather than *Lepisesia*, though the outline of primaries is nearer to *Lepisesia*. Mr. Strecker gives no account of whether the legs are armed or not, and I place the insect in its present position from the general appearance rather than from any actual conviction that it belongs here.

L. phaeton G. & R., Pr. Ent. Soc. Phil. v, 178, *Euproserpinus;* Tr. A. E. S. ii, 181, *Euproserpinus;* Hy. Edw., Pr. Cal. Ac. Sci. 1875, 89, *Eupros.;* Bd., Sp. Gen. Het. i, 363, *Macroglossa;* Grt., Can. Ent. viii, 28, *Euproserpinus;* Strk., Lep. Rhop. et Het. 124, 140, pl. xiv, fig. 1, *Macroglossa;* Grt., Can. Ent. x, 94, *Euproserpinus;* Butl., Tr. Zool. Soc. Lond. ix, 536, *Euproserpinus;* Maassen, Stett. Ent. Zeit. 1880, v, 41. p. 53 = *errato.*

errato Bd., Ann. Soc. Ent. Belg. xii, 62 (Lep. Cal. 1868), *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 529, *Macroglossa;* G. & R., Tr. A. E. S. iii, 174, pr. syn.

Wings entire. Head and thorax above of a peculiar grayish brown, concolorous with anterior wings. Abdomen darker, blackish. The pre-anal segments pale yellowish. Anal tuft black, divided; anal segment with black tufted scales. Beneath, the palpi are white, and the under thoracic surface is white mixed with slaty gray. Legs finely scaled, slight. obscurely colored. Primaries dark at base, where there are a few paler scales. A double black transverse line. The middle of the wing is concolorous with the thorax above. A discal black abbreviated line. Below the third median nervule this line is continued to internal margin. A faint sinuate line before the extremity of the middle field of the wing; this paler middle of the wing is limited by a deeper and diffuse blackish line coincident with the first and faint transverse line. Outside of this deeper line the terminal portion of the wing is obscurely darker than centrally, fringes tinted like the paler ground color of the wing. Secondaries black at base, with a very broad, pale yellowish white median band, and a deep black even terminal band. Fringes yellowish white. Beneath, the primaries are whitish, the veins darker, terminal space darkly shaded. Secondaries yellowish white, except a terminal black band. Expands 1.25 inches; 32 mm.

Hab.—California.

Also a rare species, the early stages of which are not known. It is readily distinguished from all its allies by the very pale yellow secondaries. The specimens that I have seen show little or no variation.

L. Clarkiae Bd., Ann. Soc. Ent. Fr. 2d ser. x, 318, *Pterogon;* Lep. Cal. 1856, 46, *Pterogon;* Wlk., C. B. M. Lep. Het. viii, 262, *Thyreus?;* Clem., Journ. Ac. N. Sci. Ph. iv, 134, *Proserpinus;* Morr., Syn. 1862, 154, *Proserpinus;* G. & R., Pr. E. S. Ph. v, 151, *Proserpinus;* Grt., Buff. Bull. i, 20; id. ii, 225, *Proserpinus;* Bd., Sp. Gen. Het. i, 316, *Pogocolon;* Edw., Pr. Cal. Ac. Sci. vi, 89, *Proserpinus;* Strk., Lep. Rhop. et Het. 111, pl. xiii, fig. 5, ♀, *Pterogon;* Butl., Pap. i, 103, *Lepisesia;* Tr. Zool. Soc. Lond. ix, 536, *Proserpina;* Ann. Mag. N. H. 1881, ser. 5, viii, 308, *Dieneces;* Grt., New List, 1882, *Pogocolon;* Can. Ent. xviii, 131, *Lepisesia.*

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victoriæ Grt., Buff. Bull. ii, 147, *Lepisesia:* id. 225, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix, 517, *Lepisesia:* Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 51, pr. syn.

Head greenish olive above, whitish beneath; labial palpi whitish, with green tinge. Eyes and tongue brownish black. Antennæ black above, reddish beneath, terminal spinule white, with the extreme hook yellowish brown. Thorax above greenish olive, whiter at the sides and beneath. Abdomen greenish olive with a white tinge, except the three anal and the fifth segments, which are dark olive green, the anal segment being marked in the centre with a paler streak. Beneath, the abdomen is greenish olive, with the segments edged posteriorly with white. Anterior wings rich greenish olive, paler at their base, except towards the costa, where there is a darker shade. The median space rich greenish olive, narrowing to the internal margin, and enclosing a black discal streak. Behind this band, and resting on the internal margin, is a pinkish shade, not visible in old specimens, and beyond this is a rich olivaceous band, spreading to and widening out upon the costa, the outer edge being somewhat notched. Fringe of the anterior wings olive green tipped with black. Posterior wings bright orange yellow, with a broad and moderately regular black marginal band. Fringe yellowish white. Underside of wings wholly olivaceous green, darkest at the base. Across the disc of the secondaries is a slightly waved whitish band. The discal streak of the primaries is scarcely visible. Feet and legs whitish green. Expands 1.25—1.50 inches; 31—37 mm.

Hab.—Northern California, Iowa, Oregon.

Perhaps the most common species of the genus. Mr. Edwards says "not rare in May and June. It appears to delight in the flowers of the various species of *Gilia.*"

Mr. Butler makes this species the type of his genus *Dieneces*, Ann. and Mag. N. H. 1881, p. 308, which he characterizes as follows: "Allied to *Cinogon*, but the margins of the wings not sinuated, the secondaries smaller, shorter; the anal tuft better developed, expanded in the male; coloration of *Pterogon.*"

The characters are scarcely strong enough to warrant the genus in this group. Its recognition would necessitate a distinct genus for every species here referred to *Lepisesia*—an extent to which I am not yet ready to go.

Dr. Boisduval says his specimen was raised from the larva by Mr. Lorquin, but he gives no description of it. Of this species I was able to examine the genitalia. They are of the ordinary Sphingid type, the plate somewhat flattened transversely, the superior hook short, stout, obtuse, the lower similar, but much shorter. The side piece is oblong with a rounded tip. So far as I could make out there was no distinct clasper, but this needs verification, as I had but a single available male.

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L. circeæ Hy. Edwards, Pap. ii, 9, *Proserpinus.*

In form and outline of the wings very closely resembling the Californian *P. clarkiæ* Bd., but abundantly distinct in color. The primaries are of a reddish olive tint, the basal space and that behind the median band being the palest. The band is rich, deep olive brown, almost straight on its anterior edge, sinuous on its posterior, leaving it on costa twice as wide as on inner margin, and inclosing a rather darker, ovate discal spot, shaded posteriorly with paler color. Secondaries dull chestnut red, with the base and margins darker than the centre of the wing, the basal shade being in the form of a band. There is no trace of a black band as in *P. gauræ* S. & A. Fringes fawn color, and the extreme marginal edge of the wing dark brown, particularly at the anal angle. Beneath, the wings are wholly dull reddish (inclining to chestnut) at their base, with pale central band, and margins again slightly dark. Pale shades of apex of primaries repeated. Head and thorax olivaceous. Abdomen reddish with olive tint, darkest toward the posterior extremities. Palpi whitish, as is also the base of the legs. The lower side of the abdomen has the segments narrowly edged with whitish. Expands 1.60 inches; 40 mm.

Hab.—Georgia.

Mr. Edwards, whose description is virtually reproduced above, gives as distinguishing features from *gauræ* the shorter, less dentate wings, and the lack of the black band and white margin of secondaries.

Nothing is known of the early stages.

L. gauræ Sm. Abb.* Ins. Ga. i, 61, pl. 31, *Sphinx;* Hüb., Verz. 132, *Proserpinus;* Wlk., C. B. M. Lep. Het. viii, 100, *Thyreus;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 133, *Proserpinus;* Morris,* Syn. Lep. 1862, 153, *Proserpinus;* G. & R., Pr. E. S. Phil. v, 177, *Proserpinus;* Grt., Buff. Bull. i, 20, *Proserpinus:* Bd., Sp. Gen. Het. i, 315, *Pogocolon:* Butl., Tr. Zool. Soc. Lond. ix, 536, *Proserpinus:* Grt., New List, 1882, *Pogocolon.*

Var. JUANITA Strk., Lep. Rhop. et Het. 112, pl. xiii, fig. 6, ♂, *Pterogon;* Grt., Buff. Bull. iii, 221, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix, 636, *Proserpinus;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 69, pr. syn.; Edw., Pap. ii, 10, pr. var.

Head, thorax and abdomen pale olive green; posterior margin of abdominal segments paler. Palpi white beneath, a greenish white line at sides of head and thorax. Primaries pale olive, with the median band deep olive green. Anterior edge of this band concave; the posterior from outer third of costa is a little rounded outwardly, then runs nearly parallel with the outer margin to the inner margin at about its middle. This median band is bordered posteriorly with pale yellowish green and the terminal border is shaded with bright greenish, deepened toward the costa and tip, with a pale streak at tip. Discal spot darker green, edged with a ring of pale yellowish green. Secondaries orange, with a narrow terminal blackish band; sometimes the orange color is deepened to reddish above the terminal band. Beneath, primaries rich vinous brown, broadly shading to greenish at outer third, beyond which the wing is paler, reproducing the maculation of the upper side. Secondaries deep olive basally, yellowish green outwardly. Expands 1.90—2.10 inches; 48—52 mm.

Hab.—Georgia, Texas, Kansas.

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The variations in this insect are in the color of the secondaries and the width and color of the marginal band. The color varies from bright red to orange yellow, and the band varies from a narrow black margin to quite a broad terminal band interrupted at the anal angle. The form with deep red secondaries and narrow black margin is typical; the form with yellowish or orange secondaries and more brownish rather than black margin, is *juanita* Strk. Intermediate forms occur. There are two broods, one in April the other in July.

The larva has been figured by Abbot and Smith, and described from the figure by Clemens. A good description is still a *desideratum*.

CHŒROCAMPINÆ.

Usually robust, yet elegant species. Head usually distinct, palpi rarely short and slender; tongue corneous, usually as long as the body and often exceeding the tip of abdomen. Antennæ various, usually fusiform with a rather long re-curved hook at the tip; sometimes the hook is not well marked, at others it is very prominent; in *Deilephila* there is a decided approach to a clavate tip and this genus is most nearly related to the *Macroglossinæ*. The thorax is usually smooth, crested only in *Enyo*, and the abdomen is usually long and slender, tufted in some few genera. The venation offers nothing abnormal. The wing form is variable, usually angulated in those species in which the abdomen is tufted, while in all the others the outer margin of primaries is sinuate; the apex distinct, a slight excavation below, then outward curve of the middle and a somewhat marked anal angle. There is a tendency to bright colors, and a banded or strigose style of maculation very different from the simple sober maculation of the *Sphinginæ*.

In the Tropics this family is much more numerous in genera and species, and there is an immense variety in form and color, yet they are as a rule readily distinguishable from a peculiarity of habitus, and partly also because almost everything which does not readily fit elsewhere is placed in this subfamily.

As enlarged by me, several of the genera usually placed in the *Macroglossinæ* find a place in this subfamily. It seemed to me that the former group was so capable of definite limitation, and yet so thoroughly indefinite as usually constituted that a decided advantage would be gained in removing all aberrant material from it and leav-

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ing it clear and easy of definition. The addition of these genera to the *Chærocampinæ* add a little discordant material to the already heterogeneous mass. I believe the group capable of further subdivision, but cannot attempt it here from paucity of genera and species in our fauna, belonging to those very groups which here seem aberrant.

The genera added from the *Macroglossinæ* are readily distinguished by having the abdomen tufted at the sides or at tip, and except in *Ællopos* the wings are angulated. I place them at the head of the series here, though in a classification of the species of the world other situations would probably be assigned.

Ællopos is readily distinguished by the short, rather slender antennæ, nearly subequal and furnished with a little hook at tip; by the broad depressed body, the fan-like tuft at tip of abdomen and the entire margin of wings.

This genus is a close relative of the European *Macroglossa stellatarum*, and connects that form with the *Chærocampinæ*. *Macroglossa stellatarum*, by-the-bye, offers too many points of difference from *croatica* to be considered congeneric with it, while on the other hand, despite the opaque wings, I believe *croatica* to be generically identical with the clear winged forms of *Hemaris*.

Enyo is not very closely related to the preceding. It is aberrant and easily recognized in our fauna by the prominently crested thorax, the fan-tufted abdomen and small angulated wings. This may form a subfamily type when its tropical relatives are considered.

Amphion contains a bright little species with long, fusiform antennæ recurved at tip, and the wings are angulated.

Thyreus is a peculiar form,—plump, heavy, somewhat depressed. Head retracted. Abdomen with lateral, truncate tufts to the abdomen; primaries angulated. Altogether, a distinguished form.

Deidamia is still more aberrant, with a decidedly *Smerinthid* habitus. The head is retracted, crested, the vestiture thin. Abdomen slender, tufted at tip; the primaries angulated. This form in catalogueing should be placed at the foot of the series. Its tendencies are all toward the *Smerinthids*.

The remainder of the genera are those usually referred to this subfamily, and they are all untufted, with wings not angulated, and with no striking structural features.

Deilephila has the antennæ thickened toward tip, but not forming a distinct club. The outer side of the first tarsal joint is armed with long spines, a feature not found in any other genus of the subfamily.

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Chærocampa has a very long abdomen; narrow, graceful wings and slender antennæ, with a small hook at tip. It finds a close ally in *Ællopos*.

Argeus is allied to *Chærocampa* by the slender antennæ, with a somewhat longer hook at tip. The head is large and prominent, and the body slender and graceful. The wings are rather narrow, the excavation of outer margin well marked.

The other genera have the antennæ fusiform, with a long, recurved hook at tip, or without any perceptible hook, the end being merely somewhat curved.

Pachylia is a heavy form with sombre coloring, obtuse abdomen and broad wings.

Philampelus is closely allied, but more graceful; with larger, more pointed abdomen, narrower wings and entirely different genitalia.

Ampelophaga contains smaller forms with short, slender antennæ, much more sinuate primaries and weaker legs. This genus makes a very decided approach to the *Smerinthid* type of structure.

Three of the genera,—*Pachylia*, *Philampelus* and *Argeus* are rather closely allied, the differences being principally comparative. They are recognizable by somewhat different habitus as well as by the differences heretofore pointed out.

Pachylia seems better marked than *Argeus*, but of the latter I have had no ♂ for dissection.

In tabular form, the scheme outlined above, would be as follows:

Abdomen with a fan-like tuft at tip.
- Primaries not angulated ..... **Ællopos.**
- Primaries angulated.
  - Thorax prominently crested ..... **Enyo.**
  - Thorax not crested.
    - Body not depressed; head distinct; abdomen not laterally tufted. **Amphion.**
    - Body heavy, depressed; head retracted; abdomen with a series of truncated lateral tufts ..... **Thyreus.**
    - Body slender; head retracted, with a distinct frontal crest; vestiture thin. **Deidamia.**

Abdomen not tufted.
- Antennæ gradually thickened to tip, not clubbed.
  - Anterior tarsi with first joint armed with stout spines outwardly. **Deilephila.**
- Antennæ slender, a small recurved hook at tip.
  - Anterior tarsi unarmed.
    - Abdomen elongate, slender; wings narrow, pointed, graceful. **Chærocampa.**
    - Abdomen shorter, wings broader, anal angle well marked; antennæ with longer hook at tip; head large, prominent ..... **Argeus.**

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Antennæ fusiform, with a long recurved hook, or only a slightly curved tip.
Abdomen obtuse, form heavy, wings wide ..... **Pachylia.**
Abdomen more slender, pointed; wings narrower; form more graceful.
Philampelus.
Antennæ short, not recurved at tip, wings more sinuate, legs weak, head more retracted ..... **Ampelophaga.**

ÆLLOPOS Hüb.

Verzeichniss 131.

Body depressed, fusiform, untufted; vestiture smooth. Head broad, prominent, obtuse; palpi closely applied, stout, reaching to the middle of the front and there appearing to form part of the head, pointing it off neatly. Tongue moderate in length, reaching about to end of thorax, strong, corneous. Eyes lenticular, not at all prominent. Antennæ slightly thickened toward tip, forming a somewhat indistinct club, with a short, recurved, but not spiniform tip. Legs moderate, not spinose, becoming gradually longer and stouter posteriorly; middle tibiæ with short terminal spurs, posterior with two pair of spurs, the upper pair short. Abdomen with a fan-like tuft of long, flattened hairs at tip, and laterally on the sixth segment. The lower edges of the segments spinulose. Primaries with eleven veins, venation of the usual type. Secondaries with three and four from the same point, five midway between four and six; six and seven from the end of the subcostal. Primaries comparatively small, apex acute, outer margin very oblique, even, inner margin very little sinuate, and about three-fifths as long as costa. Secondaries small, slightly produced at the anal angle, else entire.

This genus is a very readily recognizable one. The somewhat depressed, fusiform body, broad head, small wings and fan-shaped anal tuft are distinctive. The abdomen exceeds the secondaries by more than half its length, and the primaries are inserted in thorax about two-fifths from the head.

The genus is a tropical one, and the two forms in our catalogue are aberrant members of our family—rather emigrants who have a precarious sort of a footing and make occasional journeys northward than as natives. The species have been found as far North as Massachusetts and grow commoner Southward. Their true home, however, is in subtropical America. Two species appear in our catalogue,—*titan* and *tantalus*, the first described by Linnaeus, the other described by Cramer. Walker united them, and so did Clemens.

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Grote afterwards (1865) separated them again, giving the features in which they differed as he thought. Previously, Burmeister had referred *fadus* Cram., as a variety of *titan* lacking the abdominal white band. Grote considers this an error and restores *fadus* to rank as a species. Butler finally refers *titan* as a synonym of *fadus*, and places *tantalus* as a distinct species. Mr. Butler is not usually a lumper of species, and I must confess I am puzzled to know why he makes these references. Judging from Cramer's figures and descriptions I should have considered *fadus* as unquestionably distinct from *titan*, while on the other hand I cannot, on comparing the figures with what specimens I have seen separate *tantalus* from *titan*. I feel very sure that *titan* and *tantalus* are identical, while I am very doubtful, indeed, of the identity of *titan* with *fadus*. But Mr. Butler has had access to many more specimens than I could examine, and his careful study of the literature induces me to follow his synonymy, though I must express my doubts as to its correctness. Maassen makes *fadus* and *titan* both synonyms of *tantalus*, and perhaps he is nearest right.

I have examined the genitalia of *tantalus*, and they are as peculiar as the superficial appearance of the species would lead one to imagine. The side piece is narrow, subequal, the tip oblique; there is a very small, straight, corneous spur from its lower edge. The penis sheath is very heavily armed with long spinules. The supra anal plate and hooks are unique; seen from above the plate is divided at base, united by a distinct piece in the centre, then again separated and bending downward into two divaricate and slightly curved hooks; seen from below it will be seen that after the separation of the plate below its point of secondary union it divides into two distinct hoops so placed that they cannot be recognized as distinct from above. The figures on plate 4 will easily explain this peculiar structure, while description is not without difficulty. The differences between the species are hereafter pointed out.

So far as I am aware the immature forms of the species are not known.*

A. fadus Cram., Pap. Ex. i, 95, pl. 61, fig. C, *Sphinx;* Fabr., Ent. Syst. iii, 1, 378, *Sesia;* Hüb., Verz. 131, *Ellopos;* Burm., Sph. Braz. 17, an var. *titan;* Wlk., C. B. M. Lep. Het. viii, 89, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 530, *Ellopos;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 52 = *tantalus.*

* Since the above was written Mr. Hy. Edwards has described the larva of *tantalus* in Ent. Amer. iii, 163.

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titan Cram., ii, 73, pl. 142, fig. F, *Sphinx;* Hüb., Verz. 131, *Ællopos;* Lucas, in Sagra. 1856, 288; Burm., Sph. Brazil, p. 17, *Macroglossa;* H. S. Corr. Bl. 1865, 56, *Macroglossa;* Grt., Pr. E. S. Phil. v, 41, *Ællopos;* Bd., Sp. Gen. Het. i, 358, *Macroglossa;* Butl., Tr. Zool. Soc. Lond. ix, 530, pr. syn.; Maassen, Stett. Ent. Zeit. 41, p. 52 = *tantalus;* Fernald, Sphingidæ N. E. 18, *Ællopos;* Gundlach, Cont. Ent. Cuba, 174, *Macroglossa* (an sp. dist. præc.).

annulosum Swains. Zool. Ill. 1822, pl. 133 (upper figure), *Macroglossa;* Wlk., C. B. M. Lep. Het. viii, pr. syn.; Clem., Journ. Ac. N. Sci. Phil. iv, 131 = *tantalus.*

balteata Kirt., Sill. Journ. 13, 337, *Macroglossa;* Clem.. Journ. Ac. N. Sci. Phil. iv, 131 = *tantalus;* Grt., Pr. Ent. Soc. Phil. v, 41, pr. syn.

Dull blackish, more or less olivaceous, in fresh specimens bright olivaceous brown throughout. Head and thorax immaculate. Abdomen with the third segment usually white above (var. *titan*) more rarely concolorous (*fadus*); fourth segment with a large, dark brown, or lateral shade, which is much reduced on the fifth, but crosses the sixth. Anal hairs brown, olivaceous centrally; beneath, the palpi are whitish: the thorax gray, more or less clothed with olivaceous hair, the legs a trifle darker. Abdomen grayish white, a series of small white lateral dots at the lower margin of the abdominal segments. Primaries olivaceous brown or blackish; discal spot black, of variable size, sometimes wanting; a median, straight, semi-transparent whitish band from the tip of the cell to the hind margin, closely followed by a narrower, second and similar band. A somewhat arcuated band of lunulate white spots from costa to vein 3. Terminal space paler, with a purplish reflection. The outer lunulate band is sometimes geminate, the lunules narrower. Beneath, dark brown, the maculation of upper side distinctly reproduced, the outer arcuate band continued nearly to the external margin. Secondaries blackish, paler at base, shaded with yellowish along costa—medially the yellow hairs, especially in the ♀, extend across the costal half of the wing, forming an obsolete band. Beneath, brown, with two median, parallel, contiguous, distinct darker shade bands, largely shaded with white at base and along internal margin. Expands 2.20 2.30 inches; 54—57 mm.

Hab.—Florida; occasionally northward; Cuba, South America.

The description above is from Grote, Proc. Ent. Soc. v. 41, with some alterations made necessary after examination of a larger series of the species.

A. tantalus Linn., Syst. Nat. ed. x, 493, *Sphinx;* ed. xii, 803, *Sphinx;* Mus. L. U. 21, *Sphinx;* Gmel., ed. S. N. 2386, *Sesia;* Fabr., Syst. Ent. 547, *Sesia;* Sp. Ins. ii, 153, *Sesia;* Mant., Ins. ii. 98, *Sesia;* Ent. Syst. iii, 379, *Sesia;* Cram., Lep. Ex. i, 107, pl. 68, fig. F, *Sphinx;* Hüb., Saml. Ex. Schmett. ii, Sph. 3, *Ællopos;* Burm., Sph. Brazil, 17, *Macroglossa;* Wlk., C. B. M. Lep. Het. viii, 88, *Macroglossa;* Clem., Journ. Ac. N. Sci. Phil. iv, 131, *Macroglossa;* Morr., Syn. 151, *Macroglossa;* H. S. Corr. Blatt. 1865, 56 *Macroglossa;* Grt., Pr. E. S. Ph. v. 42, *Ællopos;* G. & R., Pr. E. S. Ph. v. 176, *Ællopos;* Bd., Sp. Gen. Het. i. 358, *Macroglossa;* Gundlach, Cont. Ent. Cuba, 174, *Macroglossa;* Edw.,* Ent. Amer. iii, 163, *Ællopos.*

tripunctata Goeze Beytr. iii, 2, 216, 1780, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 530, pr. syn.

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zonata Dru., i, p. 57, pl. 26, fig. 5, *Sphinx;* Westw., ed. i, 52, pl. 26, fig. 1, *Macroglossa;* Wlk., C. B. M. Lep. Het. viii, 88, pr. syn.

ixion Linn., S. N. ii, 803, *Sphinx;* Fabr., Sp. Ins. ii, 154, *Sesia;* Mant., Ins. ii, 98; Ent. Syst. iii, 1, 379, pr. syn.; Gmel., ed. Linn. S. N. 2386, *Sphinx;* Wlk., C. B. M. viii, 88, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix, 530, pr. syn.

According to Grote much smaller than the preceding, which it resembles. On the primaries the median white band is obsolete, and the subterminal arcuated band of whitish semi-transparent spots is reduced to two or three unequal, irregular spots toward the middle of the wing. Beneath, the median band is entirely wanting, while the subterminal spots are as on upper surfaces. The yellow scales on upper surface of the posterior wings in *A. titan* are absent, while the costa shows a paler, somewhat whitish shade. The abdomen is paler and the brown terminal segmentary bands are brighter and more reddish than in *A. titan.* Expands 1.80 inches; 45 mm.

Hab.—Florida, ranging northward occasionally to Massachusetts; Cuba, South America, Lower California.

None of the characters pointed out by Mr. Grote are constant. Within a limited range this is an extremely variable species. The discal spot may be absent, and from this point to a distinct transverse bar closing cell I have seen all intergrades. The upright, geminate, transverse line reaching to the cell may be very strongly marked, or not recognizable at some portion of its course. The outer band of lunulated spots may be geminate in part, in which case the lunules are narrow, or the lunules may be broad and distinct, and in a single series. The terminal space may or may not be paler. The abdomen varies also; the white band is constant in my experience. The fourth segment is sometimes an intense deep black, the fifth with a round black spot on each side of the middle, the sixth again entirely black. The black may be replaced by brown or red in the ordinary form, or the entire abdomen, except the third segment may be olivaceous yellowish. I therefore repeat that I am very sure that *titan* and *tantalus* are identical, while *fadus* is probably distinct, but as the settlement of this question is rather for the entomologists in the true home of the insect I follow Mr. Butler in the synonymy.

Ixion also seems to me much more likely to be *fadus* than *tantalus,* but in the interests of a stable nomenclature I retain the present synonymy, since there can never be any positive certainty as to the form Linnaeus really had before him.

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ENYO Hüb.

Verzeichniss, 132.

Body, as a whole, long, stout and fusiform; the head large, prominent, broad; front nearly vertical, flattened and smooth; eyes large and prominent; palpi smooth, stout, closely applied to the front and reaching about to the middle. The tongue is stout, about as long as the body. The antennæ are fusiform, rather short, the clothing of ciliæ very short, at tip recurved into a long pointed hook. The vestiture is hairy. Thorax rather long, the vestiture smooth, but forming a very prominent anterior crest. The primaries are inserted just before the middle of the thorax. Abdomen long, stout, conic, with a spreading, though not very large anal tuft. Legs unarmed in any way, except for the usual spurs of middle and hind tibiæ. The fore legs are shortest, the posterior much the longest and clothed with rather long hair, while the others are not so distinguished. The anterior femora are very long, and the anterior portion is inferiorly excavated to receive the tibia. Primaries proportionately short and narrow, the apex obtuse, excavated beneath to vein 5, where it is again excavated to the anal angle, which is decidedly produced. Internal margin sinuate. Secondaries narrow, the anal angle produced into a broad, rather obtuse angle. Frenelum distinct, in the ♂ running in a loop from costa of primaries, in the ♀ without this loop. Primaries with eleven veins, secondaries with eight, the cell short.

The genitalia of the ♂ are peculiar. The supra-anal plate is produced into a long, straight, acute spine, and the inferior spur is broader, but less than half its length. The side piece is rather long, its superior angle extended, finger-like; in fact, the end of the side piece is marvelously like the outline of a closed hand with the index finger extended. The males, too, are furnished with a pencil of yellow hair at the base of the abdomen resting in a groove between the dorsal and ventral portions of the first and second segments, the pencil extending to the middle of the second segment.

This genus is readily recognized by the prominent thoracic crest alone, which is unique in our fauna. The peculiar modification of the supra-anal plate and hook is interesting, and is not paralleled elsewhere in the family. The thorax is produced to an unusual extent before the base of primaries. There is only a single North American species.

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E. lugubris Linn., Mant. ii, 537, *Sphinx;* Fabr., Syst. Ent. 537, *Sphinx;* Mant. Ins. ii, 92, *Sphinx;* Sp., Ins. ii, 140, *Sphinx;* Ent. Syst. iii, 1, 356, *Sphinx;* A. and S. Ins. Ga. i, p. 59, pl. 30, *Sphinx;* Gmel. ed. Linn. S. N. V. 2372, *Sphinx;* Dru., Ex. i, 61, pl. 28, fig. 2, *Sphinx;* Westw., Ed. Dru. iii, p. 55, *Thyreus;* Hüb. Verz. 132, *Enyo;* Swains. Zool. Ill. i, *Thyreus;* Harr., Cat. Sph. Sill. Journ. 36, 306, *Thyreus;* Wlk., C. B. M. Lep. Het. viii, 113, *Enyo;* Burm., Sph. Braz. p. 16; Verh. Nat. Ges. Halle, iii, 73, *Pterogon;* Clem., J. Ac. N. Sci. Phil. iv. 139, *Enyo;* Morr., Syn. 1862, 162, *Enyo;* H. Sch. Corr. Blatt, 1865, 57, *Enyo;* Bd., Sp. Gen. Het. i, 297, *Epistor;* Butl., Tr. Zool. Soc. Lond. ix, 540, *Enyo;* Gundlach, Cont. Ent. Cuba, 180, *Enyo;* Butl., Pap. i, 103, *Enyo;* Grt., Hawk Moths 29, *Enyo.*

fegeus Cram., Ex. iii, 56, pl. 225, fig. E, *Sphinx;* Hüb., Verz. 132, *Enyo* (*phegeus*); Wlk., C. B. M. Lep. Het. viii, 113, pr. syn.; Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 54, an sp. dist.

luctuosus Bd., Sp. Gen. Het. i, 297, *Epistor;* Butl., Tr. Zool. Soc. Lond. ix. 632, pr. syn.

camertus Cram., Ex. iii, 53, pl. 225, fig. A, *Sphinx;* Stoll., Suppl. to Cram. pl. xxii, fig. 1, 1*a*, larva and pupa; Hüb., Verz. 132, *Enyo;* Wlk., C. B. M. Lep. Het. viii. 114, *Enyo;* Burm., Sph. Braz. 16, *Pterogon;* Clem., J. Ac. N. Sci. Phil. iv. 140, *Enyo;* Morr., Syn. 1862, 163, *Enyo;* H. Sch., Corr. Blatt. 1865, p. 57, *Enyo;* Grt., Pr. E. S. Phil. v. 44, *Enyo;* Bd., Sp. Gen. Het. i, 288, *Epistor;* Wallengren, Œfv. Vet. Akad. 1871, 913, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix, 541, pr. syn.; id. Pap. i, 140; Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 54, pr. syn.; Grt., New List, 1882. an sp. dist.; Gundlach, Cont. Ent. Cuba, 180, an sp. dist.

General color a rather rich chocolate brown, often with a purplish or reddish hue; palpi beneath, bright reddish brown; eyes golden. Thorax with the margins of patagiæ obscurely darker, more distinctly so towards the tip. Abdomen with an indistinct double row of dorsal, dark brownish spots. Under side of thorax and abdomen pale reddish brown, with a tawny line in the middle of the ventral surface of the abdomen; yellow lateral dots on the hind portions of the segments. Primaries with a decided rufous tinge in the middle and toward the apex. An oblique, rigid, pale line margined on each side by a darker shade line from costa two-fifths from base to the inner margin about one-third from base; within this is a somewhat diffuse and indefinite pale line, which is curved and still more oblique than the other; the costal portion of the interval between this latter line and the base rather deeper, richer brown. Discal spot small, black, narrowly edged with yellowish; beyond this a series of four rather obscurely defined dentate lines cross the wing, nearly parallel with the outer margin. A distinct richer brown shade runs from the costa above the discal spot to the outer margin above the anal angle, filling the terminal space to the middle of the space between veins three and four, and extending upward as a margin to a curved line running from the costa near the apex to the outer margin between veins three and four. This line is also margined inwardly with a deeper shade. A bright reddish brown oblong spot on costa near the apex. Secondaries crossed by a broad diffuse brown shade near to and parallel with the outer margin, the veins tipped with deeper, rich brown at the margin, the spots decreasing in size

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from the hind angle. Beneath the wings are more reddish, crossed by two faint common lines, the terminal space darker. Expands 2—3 inches; 50—75 mm.

Hab.—Georgia to Florida; West Indies; Mexico; occasionally northward to Massachusetts.

This species is so strongly characterized and so different from anything else in our fauna, that there should be no difficulty in recognizing it. It varies somewhat in ground color, in size and distinctness of maculation. In *camertus* we have a smaller form, the primaries less dentate, the lunate line from apex to the outer margin very strongly marked. Extremes would seem to indicate two species, but I would hardly care to separate them after Mr. Butler, who probably had a large material at hand for comparison, and is not usually classed as a "lumper," has united them. The description above is of a somewhat intermediate form. Gundlach considers the species distinct, and relies on the ground color and some minor details of maculation to separate them. The *camertus* form seems confined to the more southern countries and has been found in our territory in Florida only, so far as I am aware. Stoll figures the larva of *camertus*, and his figure does not differ greatly from that given by Abbot, allowing for inaccuracies in coloring. It is rare in the Northern States, and probably does not breed there. In the South it is double brooded and appears in May and September.

The larva was figured by Smith and Abbot, and described from the figure by Clemens. No other or better description has been found by me.

The better to show the characters relied on I add the differences between *Enyo lugubris* and *E. camertus* as enumerated by Gundlach Cont. Ent. Cuba, 181:

lugubris.	**camertus.**
The ground color is darker.	..... lighter.
The ocellar point is small.	.....larger.
The dark part occupies the apical half of the wing from the anterior border towards the anal angle, which, however, is light.	.....all the apical half from the transverse border.
The external edge of the anterior wings has not, toward the apex a well marked semi-lunar spot and the external border has no very salient or black points.	.....has a semi-lunar spot plainly visible, of a light or ash color, and the border has various blackish sinuations.
The thorax above has no longitudinal medial dark line.	.....has a longitudinal medial dark line.
Second segment of abdomen without transverse blackish border.	..... with a blackish transverse border.

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AMPHION Hüb.

Verzeichniss, 1816, p. 135.

Body plump, robust, wings comparatively short and narrow. Head small, not retracted; eyes small, semi-globose, fringed with distinct lashes; palpi moderate, projecting straight forward, forming with the vestiture of front a short snout; tongue nearly as long as the body; antennæ fusiform, with a large, slender, curved hook at tip; slightly ciliate in the ♂, simple in the ♀. Thorax plump, narrowing abruptly in front of the base of primaries, widening posteriorly; vestiture smooth, upturned and forming indefinite tufts posteriorly. Abdomen plump, narrowing suddenly to the tip, which is provided with a fan-like tuft; the posterior edge of segments with several series of scale-like spinules. Legs rather short; posterior longest and stoutest; anterior and middle tibiæ with a few spinules near tip; posterior apparently unarmed; spurs of median and hind tibiæ small.

Primaries narrow, short, outer margin bisinuate; excavated below apex and again above the anal angle. Anal angle prominent, hind margin sinuate; venation of the usual type, vein 10 wanting. Secondaries with the outer margin excavated before the anal angle, which is somewhat prominent. The supra-anal plate and hook are modified into a structure most nearly resembling a lobster's claw, the upper part largest and stoutest, the lower more slender and somewhat more pointed. The side piece is rather short and broad, the tip oblique; the clasper a small curved spur. The corneous sheath of penis has a distinct curved hook at tip.

A strongly marked genus. The very plump form and the short abdomen, which narrows so suddenly, the small, stout wings, the fan-like anal tuft and the fusiform antennæ are characteristic features.

We have but a single species:

A. nessus Cram., Pap. Ex. ii, p. 16, pl. 107, fig. D, *Sphinx:* Fabr., Sp. Ins. ii, 140, *Sphinx;* Mant., Ins. ii, 92, *Sphinx;* Ent. Syst. iii, 1, 355, *Sphinx;* Gmel., Ed. Linn. S. N. v. 2372, *Sphinx*; Hüb., Verz. 135, *Amphion;* Enc. Meth. pl. 66, fig. 1, *Sphinx*; Harr., Sill. Journ. 36, 308, *Thyreus?;* Wlk., C. B. M. Lep. Het. viii, 99, *Thyreus;* Clem., Proc. Ac. N. Sci. Phil. iv, 136, *Thyreus;* Morr., Syn. 1862, 157, *Thyreus;* G. & R., Proc. E. S. Ph. v. 151, 176, *Amphion;* Beth., Can. Ent. i, 10, 47 (49), *Amphion:* Bd., Sp. Gen. Lep. Het. i, 316, pl. 1, figs. 5 and 6, larva and pupa, *Pogocolon;* Andrews,* Can. Ent. ix, 19, *Thyreus;* Butl., Tr. Zool. Soc. Lond. ix, 535, *Amphion;* Pilate, Pap. ii, 66; Fernald,* Sphing. 20, *Amphion;* Holland,* Can. Ent. xviii, 102; Grt., Hawk Moths 28, *Amphion.*

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The head, palpi and thorax are dull, rusty brown; palpi beneath and breast rufescent; a yellowish white streak on the sides of the head and prothorax, and a transverse ferruginous line at base of thorax. The abdomen is a dark chestnut brown, with the hind margin of the fourth, or more rarely the fourth and fifth segments pale yellow, with three or four bright, ferruginous, lateral spots beginning on the fourth segment, and two very small pure white tufts on the posterior segments; apical tuft deep chestnut brown. Beneath rufescent, with three lateral white dots on the hind portion of the posterior segments. Primaries brown, with a purplish hue, costa powdered with gray scales; an indistinct dark brown band and line in basal space; a broad, dark brown, oblique, transverse, median band, divided above the median vein to the costa and containing the paler discal spot; a greenish subterminal line nearly parallel to outer margin, anteriorly edged by a narrow, dusky shade; a subapical bright red costal patch, below which is a deep brown shade; a deep brown spot crossing the terminal space just below the middle; a brown patch at anal angle; fringes pale in the excavate portion of the margin. Secondaries of a rich, deep brown, with a central reddish band, which, starting from the costa, merges gradually into the ground color before reaching the hind margin; fringes yellow, more or less interrupted with brown in the apical half. Beneath, primaries to the middle rich crimson brown; beyond, a ferruginous shade to the dark purplish brown outer margin; an apical gray patch and a sprinkling of gray scales along costa. Secondaries ferruginous, with a broad, purplish outer margin, a dusky discal spot and two crimson brown transverse lines, the inner being broadest. Expands 1.75—2 in.; 44—50 mm.

Hab.—Canada to Georgia; westward to Missouri, Iowa, Illinois.

The species is locally common, and is a Northern rather than a Southern form. It flies early in June in the hottest sunshine, and occasionally also in the evening. Dr. Holland says he has taken it at light, and near Pittsburgh it flies mostly at dusk. If found flying in the middle of the day he "has noticed that it always keeps in the shadow, or slyly hovers about among the thick masses of the *Syringa* blossoms in the deep umbrageous recesses, where it is not easily reached by the net of the collector."

The larva has been superficially described by Andrews, Boisduval and Fernald, but a good life history is still a *desideratum*.

THYREUS Swains.

Zool. Illustrated i, 1821, pl. 60.

Body very stout, somewhat depressed. Head broad, not prominent; eyes moderate, strongly lashed superiorly; a low conic tuft on vertex; tongue nearly as long as the body; palpi densely scaled, closely applied to the front and reaching barely to its middle. Antennæ fusiform, bent into a long hook at tip; the tip tapering gradually, not suddenly to a point; simple in the ♀, laterally ciliated in

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the ♂ and somewhat thickened. Thorax well developed, rather broader than long, with a transverse ridge of short truncated tuftings along base. Abdomen somewhat depressed beneath, with a pointed anal tuft, above which is a larger, but shorter truncated tuft; laterally with truncated tufts becoming larger toward the tip. The segments are not spinulate, but the posterior edges are somewhat raised and the edge is very densely set with very fine, sharp denticles. Legs unarmed, the posterior pair not much longer than the anterior, but apparently much stouter from the dense clothing of long hair on tibiæ; median tibia with a pair of short terminal spurs; posteriors with two pairs of longer unequal spurs. Primaries long and narrow, very small in proportion to the large body, produced at apex, middle of outer margin and anal angle, excavate between; 11 or 12 veined, venation of the ordinary type. In the ♂ provided on costa beneath, with a loop for the frenelum; in the ♀ this is wanting. Secondaries with 3 and 4 from the end of median vein; 5 nearly midway between 4 and 6; 6 and 7 from the end of the subcostal. In form they are somewhat trigonate, the anal angle somewhat produced.

The side piece of the ♂ is somewhat curved, subequal, obtusely rounded at tip; inferiorly with a moderate, somewhat curved, pointed, corneous clasper. The supra-anal plate is produced into a rather long, scarcely curved, somewhat flattened, pointed hook; the inferior process is much stouter, about half as long as the superior and also pointed, but obtuse at tip.

This remarkable genus contains but a single species very readily recognized by the generic characters alone. It is:.

T. abbotii Swains., Zool. Ill. i, pl. 60, *Thyreus;* Harr.,* Sill. Journ. 36, 307, *Thyreus;* Kirtland, Proc. Ac. N. Sci. Phil. 1837, 148; Wlk., C. B. M. Lep. Het. viii, 99, *Thyreus;* Clem.,* Journ. Acad. Nat. Sci. Phil. iv, 135, *Thyreus;* Morris,* Syn. Lep. 1862, 156; Riley,* Am. Ent. ii, 123, fig. 84; 2d Rep. Ins. Mo. 78, fig. 54, *Thyreus;* Bd., Lep. Guat. 1870, 66, *Brachynota;* Sp. Gen. Lep. Het. i, 301, *Thyreus;* Whitney,* Can. Ent. viii, 75; Andrews,* Can. Ent. viii, 100; Harris,* Ent. Corr. 284, pl. 3, fig. 9; Saund.,* Can. Ent. x, 130, fig. 7, *Thyreus;* id. xiii, 2, fig. 2, *Thyreus;* Butl., Tr. Zool. Soc. Lond. ix, 534, *Thyreus;* Fernald,* Sphingidæ, 22, pl. iv, fig. 4, *Thyreus;* Grote, Hawk Moths 28, *Thyreus.*

Head, palpi and thorax dull chocolate brown; hind edge of collar usually black; a transverse black band from base of primaries, arcuated cephalad; the transverse tuftings at base, are darker tipped. Abdomen dull brown, blackish at base, somewhat paler and with a more or less distinct iridescence across the middle, darker at tip. The anal tuft is dull yellowish brown, the central pointed

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tuft yellow; the lateral tufts are brown. Primaries dull brown, paler beyond the middle to the terminal space; more evenly colored in the ♀. An oblique black line, heaviest at its inception on inner margin about one-third from base, narrowing evenly to its termination on costa at about the middle of the wings. Five blackish lines from the middle of inner margin outward, curving strongly toward outer margin and lost above the middle of wing in the long blackish spur in the interspace between veins 5 and 6; above this the lines are again traceable, but indistinct and very strongly dentate. The terminal space is dull brown, with blackish spots of variable sizes on outer margin above the angle on vein 4. Discal dot minute, blackish. Secondaries bright yellow at base, with a brown outer band, toward anal angle broken up into interrupted blackish bands. Beneath, paler throughout. Primaries yellowish at base, with a yellowish transverse shade at outer third, through which runs a strongly dentate blackish line. Secondaries yellow at base, costal region powdered with brownish, with a broad brown outer margin and two dentate blackish lines, the inner incomplete. Expands 2.30—2.60 inches; 57—65 mm.

Hab.—Canada, Eastern United States, westward to Iowa.

One of the most characteristic and easily recognized forms of the family by the broad, heavy body, the lateral tuftings of abdomen, the narrow, short primaries and yellow secondaries. The antennæ are yellow.

The life history of the species has been known since it was first described, and nearly every writer has either originally or following others, described the larva. Prof. Riley's figures have made both insect and larva well known everywhere since they have been used in almost every subsequent work dealing with this species.

Clemens says of the larva that its position when disturbed is not Sphinx-like; it shortens the anterior rings and throws the head from side to side, making at the same time a crepitating sound. When on the ground its motions are often violent.

The larva varies considerably, and for quite a time it was considered that the two most diverse forms indicated sexes. However, it has been proved that both sexes are produced from each form of the larva, and that the theory of sexual modification in the larva is a mistaken one.

DEIDAMIA Clem.

Journ. Ac. N. Sci. Phil. iv, 137, 1859.

Body quite fusiform. Head small, retracted, laterally compressed, with a distinct crest between the antennæ; palpi small, shaggy, not attaining the vertex; eyes rather small, round, with hairy lashes. Antennæ fusiform, tip pointed, but slightly hooked, without seta; biciliate in the ♂, simple in the ♀; tongue rather more than half

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the length of the body. Thorax stout, the wings inserted well forward; vestiture fine, recumbent, forming an indistinct dorsal crest. Abdomen conic, in the ♂ with a small anal tuft; segments armed with spinules on the hinder edge. Legs comparatively small and weak, the posterior not much longer or stouter than the anterior; median tibiæ with a pair of minute terminal spurs, and posterior with two pairs of small spurs; tibiæ otherwise unarmed. Primaries narrow, outer margin angulated; apex truncate; thence excavate to vein 4, where it is produced, and below this deeply indented; anal angle prominent, produced; inner margin sinuate; 12 veined, the venation of the normal type. Secondaries small, outer margin sinuate, slightly denticulate and somewhat produced on vein 1b; venation of the normal type. The supra-anal plate of the ♂ is elongate, triangular, with the hook moderately long, stout and not much curved, obtuse at tip; the inferior projection about two-thirds as long and acute at tip; side pieces elongate, rather narrow, with an obliquely rounded tip; clasper a long, corneous shank running to the base, produced at about the middle of side piece into stout hook, dilated basally and with a somewhat curved, more slender tip.

This peculiar genus is readily recognizable; the *Smerinthoid* wing shape, combined with the elongated corneous tongue, the compressed frontal tuft and rather slender abdomen, form a combination not easily mistakable.

Mr. Butler, in Pap. i, 103, says of the genus: "Seems, excepting in the form of secondaries, to be intermediate in structure between *Lophura continua* (of Brazil) and *Amphion nessus*. It also seems allied to *Mimas* and *Cypa*, two old world genera of *Smerinthinæ*. To which has it really most affinity?" To the *Smerinthinæ*, by all odds, I think.

Maassen makes *Deidamia* a synonym of *Pterogon*, showing thus that he knows neither of them structurally.

There is but a single species in our fauna.

D. inscriptum Harr.,* Cat. Sph. Sill. Journ. 36, 306, *Pterogon?*; Wlk., C. B. M. Lep. Het. viii, 100, *Thyreus?*; Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 137. *Deidamia*; Morris, Cat. Lep. 1860, 18, *Proserpinus*; Synopsis, 1862, 159, *Deidamia*; G. & R., Proc. Ent. Soc. Phil. v. 151, *Deidamia*; Bd., Sp. Gen. Het. i, 302, *Trichocolon*; Grt., Buff. Bull. i. 20; id. ii, 225, *Deidamia*; Strk., Lep. Rhop. et Het. 112, pl. 13, fig. 8, ♂, *Pterogon*; Butl., Tr. Zool. Soc. Lond. ix, 535; Pap. i, 103, *Deidamia*; Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 53, *Pterogon*; Fernald,* Sphing. 69, *Deidamia*; Grt., Hawk Moths 29, *Deidamia*.

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Head and thorax brownish gray. Head whitish above the eyes, palpi darker brown. Thorax with a double curved white line edged with brown at tip of collar, another single line across the middle of tegulæ and another at base; the latter often indistinct. A brown dorsal spot. Abdomen a darker brownish gray, dorsum darker, and with a row of subdorsal deep brown spots each side of the middle; anal tuft brown. Primaries ashy gray, maculation brown. An indefinite, narrow, basal transverse line; a second more distinct, rigidly oblique; a broad band at about one-third from base, somewhat incurved inferiorly. Median space evenly gray, somewhat powdery; discal spot indefinite, somewhat paler, outwardly defined by darker scales; a broad sinuate band beyond middle, inwardly even, outwardly dentate below the middle; below vein 6 a dusky shade extends outwardly to the pale subterminal shade; above this darker shade the apical region is pale gray; below the apex two large lunate marginal spots, inwardly defined by a narrow white line; between veins 6 and 7, close to the lower of the marginal spots, is a semi-oval brown spot, preceded by a somewhat reddish yellow shade; two faint dusky lines cross this paler space; from the white line margining the terminal lunules above described a pale, somewhat diffuse shade extends to the margin at the middle angle; below the dark outward shade a rather bright brown, transverse line dentate on the veins, crosses the paler space, followed by a decided reddish shade. Secondaries dull reddish brown, with a darker terminal band. Beneath, primaries dull fawn gray, ashy along costa; a bright red brown, rigidly oblique transverse line near margin, beyond which the space to the dark, irregular outer margin is powdered with red; a distinct white spot above vein 6 in the dark outer margin. Secondaries with the color and outer margin as in primaries, but without the white spot. Expands 1.90—2.25 inches; 47—56 mm.

Hab.—Canada to Virginia; westward to the Mississippi Valley.

This species is by no means common. It is readily known by the generic characters as well as the somewhat peculiar maculation. Little is known of its habits, and, though the species has been quite frequently bred, the larva has been described only in the most general terms.

DEILEPHILA Ochs.

Schmett. Eur. Band. iv. p. 42, 1816.

Body stout, fusiform. Head of moderate size, not sunken, smoothly clothed; tongue about as long as the body; palpi reaching to the middle of the front, the tip somewhat enlarged by the vestiture. Antennæ subclavate, gradually enlarging outwardly to the tip, where they are furnished with a little, recurved, bristly hook; eyes moderate in size, with distinct lashes. Thorax stout, untufted; the primaries inserted well back. Abdomen untufted, conic, the tip acute, tapering rather gradually in *lineata*, more abruptly in *chamænerii*; hinder edge of the segments densely set with small spinules. Tibiæ not spinose, gradually increasing in size, so that the posterior is nearly

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twice as long and stout as the anterior; median tibia with a single pair of unequal spurs at tip; posterior with two pairs of longer, unequal spurs. Anterior tarsi with a row of stout, curved spines outwardly, most prominent in *lineata*.

Primaries with eleven veins, the cell short; outer margin arcuate, entire, oblique; apex acute; hind margin very little sinuate. Prof. Fernald says the primaries have sometimes twelve veins; none of the specimens examined by me had more than eleven, but it is not unlikely that 9 does occasionally branch; in such case vein 10 must be very difficult to see, except by fully denuding the wing. Secondaries with 2, 3 and 4 nearly equidistant at base; 5 midway from the cross-vein. The margin is entire, except for a slight projection on vein 1b.

The genitalia of the male have the supra-anal plate produced into a short, abruptly pointed and slightly curved hook; the inferior projection nearly as long as the superior, but thicker, the tips blunt. Side pieces enlarging somewhat toward tip, then rather suddenly rounded off, the angle rather inferiorly. From the inferior margin near the base arises a single corneous hook, differing somewhat in form in the two species.

The European fauna is rich in forms in this genus, while in America but two species are found. They have a habitus all their own, and are consequently recognizable at a glance whenever a single typical form has been once carefully observed.

Two species are known from our fauna, one of which is claimed as identical with European forms, viz., *chamœnerii* with *gallii*. This question will be more fully discussed hereafter.

Chamœnerii has the spinules of tibia less marked, the abdomen more abruptly conic, the thorax immaculate on disc, the veins of primaries not white lined.

Lineata has the tarsal armature much heavier, the abdomen more elongate, the thorax with longitudinal white lines; primaries with veins white, marked.

D. gallii Rott. Naturf. vii, 107; Wlk., C. B. M. Lep. Het. viii, 166; Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 144; Bd., Lep. Cal. 66; G. & R., Pr. E. S. Ph. v. 156; Tr. A. E. Soc. ii, 75; Strk., Lep. Rhop. et Het. 79; Bd., Sp. Gen. Het. i, 169; Butl., Tr. Zool. Soc. Lond. ix, 569.

chamœnerii Harr.,* Sill. Journ. 36, 305, *Deilephila;* Ag., Lake Superior, 387, pl. vii, fig. 2; Wlk., C. B. M. Lep. Het. viii, 167 = *gallii;* Morr.,* Syn. 1862, 165, *Deilephila;* Harr., Inj. Ins. 328; Lint.,* Pr. E. S. Ph. iii. 660, *Deilephila;*

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Grt., Pr. E. S. Phil. v. 40, *Deilephila;* Buff., Bull. i, 20, *Deilephila;* id. ii, 225, *Hyles;* Strk., Lep. Rhop. et Het. 79 = *gallii;* Saund., Can. Ent. ix, 63, fig. 2. *Deilephila;* Fruit Ins. 256, fig. 267; Edw., Pr. Cal. Ac. Sci. vi. 90; Maassen, Stett. Ent. Zeit. 1880. v. 41, p. 58, pr. syn.; Fernald,* Sphingidæ N. E. 55, pl. 2, fig. 1. *Deilephila;* Grt., Hawk Moths 31, *Deilephila.*

intermedia Kirby, Fn. Bor. Am. iv, 302; Harr., Sill. Journ. 36, 306; G. & R., Pr. E. S. Phil. v. 179; Bd., Sp. Gen. Het. i, 169, pr. syn.; Strk., Lep. Rhop. et Het. 140, pr. syn.; Beth., Can. Ent. x, 152, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix, 569.

canadensis Gn. mss. G. & R., Pr. E. S. Phil. v. 179, pr. syn.

epilobii ‖ Harr., Cat. Ins. Mass. 1833, 590; Sill., Journ. 36, 305 (*nomen bis lectum*).

The upper side of the head and thorax is olive brown, with a white stripe along each side, which is edged with black on the upper side along the thorax. The palpi are whitish beneath and olive brown above. The abdomen is olive brown, with a row of small white spots along the middle. The first and third segments are marked with black on the sides; the second, fourth and following segments with white, some of them more or less suffused with pink. The under side of the thorax and the legs are of a dull yellowish brown and the abdomen is darker brown with white lines along the edge of the segments. The primaries are olive brown with a buff colored band extending from the hind margin near the base to the apex of the wing. The lower edge of this band is slightly sinuous, and the upper is irregularly indented. There is a black patch at the base of the wing and another at the end of the cell, and the terminal space and fringes are olive gray. The secondaries are black, with a rose-red central band, which ends in a white spot at the inner margin. The outer margin is narrowly edged with dull brown, which is often stained with reddish. Fringes white. Beneath paler, more sordid than above, the maculation of upper side reproduced, the band on primaries not reaching the hind margin and broader basally, so that it becomes really an oblique triangle. Expands 2.65—3 inches; 65—75 mm.

Hab.—Canada to Georgia; westward to California; Labrador.

The clasper of the ♂ in this species is rather small, slender, but little curved, acute at tip.

A widely distributed, but rather distinctively Northern form, and easily recognizable from the characters above given.

Walker first referred this as a synonym of *gallii*, and he is followed by Clemens in this reference. Harris states that the larva of this species differed from that of the European form, but Dr. Harris knew only one of the varieties of the larva, and I cannot find any essential differences from descriptions. Mr. Grote again, in 1865, Pr. E. S. Ph. v. 40, separates the forms as distinct; he says: "I find the following differences in the imagos, which I am satisfied are specifically distinct. In our species the central fascia on anterior wings is of a warmer shade, not excavated inwardly at base, and not con-

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tinued so near the apex as in *D. gallii;* the apices show a very distinct black streak, absent in the European species. The central fascia of the inferior wings is more suffused with rose color. The basal abdominal segment is less black laterally than in *D. chamœnerii*, while I notice a few minor differences which are perhaps not constant, as are those I have cited."

Now, of all these there is but one feature constant, viz., the color. The American specimens are more intensely colored and rather smaller than the European examples, but otherwise I cannot find any constant differences. In genital structure they are identical. The greater intensity of color is a character of nearly all American representatives of European forms. In the Noctuidæ, European and American specimens of the same species are nearly always separable in this way. I would, therefore, retain the term *chamœnerii* to express a geographical form or race—hardly a variety, for in that case all the American forms of European species must receive names.

None of the American specimens I have seen reach the average size of *gallii*, which has also proportionally longer and stouter antennæ.

Harris, and after him, Clemens and Morris describe the larva in general terms, as: "Green, somewhat bronzed, dull red beneath; with nine round cream colored spots encircled with black on each side, and a dull caudal horn."

Prof. Fernald states that the species is common about flowers near Orono, Maine. It is rare south of Massachusetts.

D. lineata Fabr., Syst. Ent. 541, *Sphinx;* Sp. Ins. ii, 147, *Sphinx;* Ent. Syst. iii, 1, 368, *Sphinx;* Mant., Ins. ii, 96, *Sphinx;* Gmel. ed. Linn. 2383, *Sphinx;* Sm. Abb.,* Ins. Ga. i, 77, pl. 39, *Sphinx;* Donovon, pt. 6, pl. 204, fig 1, *Sphinx;* Hüb., Verz. 137, *Phryxus = livornica;* Harris,* Sill. Journ. 36, 304, *Deilephila;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 143, *Deilephila;* Morris,* Syn. 1862, 164; Harris,* Inj. Ins. (Flint ed.) 382; Lint.,* Pr. E. S. Phil. iii. 662; Grt., Pr. E. Soc. Phil. iv. 319, *Deilephila;* G. & R., Pr. E. S. Phil. v. 156, 179, *Deilephila;* Riley,* Am. Ent. ii, 257, ff. 162–164, larva; 3d Mo. Rep. 140, figs. 60–62; 8th Mo. Rep. 122, figs. 42–44, *Deilephila:* Saund., Can. Ent. ix, 63, figs. 2–4; Edw.,* Pr. Cal. Ac. Sci. v. 91; id. vii, 20; Butl., Tr. Zool. Soc. Lond. ix, 569, *Deilephila;* Behr., Pap. ii, 2 (food plants); Pilate,* Pap. ii, 66; Saund.,* Fruit Ins. 254, figs. 264–266; Fernald,* Sphing. N. E. 56, pl. ii, figs. 2–4; Gundlach, Cont. Ent. Cub. 196, *Deilephila:* Grt., Hawk Moths 31, *Deilephila.*

daucus Cram., Lep. Ex. ii, 41, pl. 125, fig. D, *Sphinx;* Fabr., Sp. Ins. ii, 147, pr. syn.; Gmel., ed. Linn. 2384, pr. syn.; St. Farg. and Serv. Enc. Meth. pl. 66, fig. 5, *Sphinx;* Steph., Ill. Br. Ins. Haust. i, 126, *Deilephila;* Wood, Ind.

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Ent. 246, pl. 53, fig. 27, *Deilephila;* Wlk., C. B. M. Lep. Het. viii, 171, *Deilephila;* H. S. Corr. Bl. 1865, 58, *Deilephila;* Bd., Lep. Cal. 65; Sp. Gen. Het. i, 173, *Deilephila;* Edw., Pr. Cal. Ac. Sci. vi. 91.

oxybaphi Clem.,* Journ. Ac. N. Sci. Phil. iv. 145, larva only.

Head, thorax, abdomen and primaries olivaceous brown. Thorax with three parallel white stripes on each side of the middle; the first over the base of the wings and extending forward over the eyes to tip of the palpi; the second, through the middle of the patagiæ, and the third along the upper edge of the patagiæ. There is also a white line running from the top of the head, back through the middle of the collar. There is a double row of elongated black spots, with a central row of small white ones, along the middle of the abdomen, and on each side is a row of alternate black and white spots, decreasing in size towards the end of the abdomen, below which the sides are reddish. Beneath very pale olivaceous gray, or sordid whitish gray. Primaries with a buff stripe extending from near the base of hinder margin to the apex, overlaid on the basal part with whitish hairs. The hinder margin is narrowly edged with white, and veins 1–7, as well as the discal, or cross vein, are marked with white as far as the terminal space, which is purplish gray. The fringes are somewhat lighter. Secondaries black, with a central reddish band, which encloses a whitish spot near the hinder margin. The outer margin is narrowly edged with brownish, tinged with reddish. Fringes white. Beneath, paler than above; throughout, the lighter portions of the wing more or less sprinkled with brown. Expands 3.25—3.60 inches; 81—90 mm.

Hab.—Canada, United States, Cuba.

The ♂ clasper differs from that of *gallii* in being much stouter, comparatively shorter, with the tip more abruptly pointed. In other respects it is not different.

The species is a widely distributed one, and it is common nearly everywhere. It flies early in the evening, often in bright daylight.

The larva of this species has been figured by Riley, the two prominent forms being given, and his figures appear in nearly every subsequent work. No very detailed description has been given, and it is not easy to do so, because of the great range of variation.

One of the recent numbers of "Entom. Amer." contains a statement that the larva serves as food to some Indian tribe.

CHŒROCAMPA Dup.

Hist. Nat. Lep. de France, Suppl. t. ii, p. 159, 1835.

Slender and gracefully built. Head distinct, but not prominent, broad, vestiture fine and smooth; eyes large, hemispherical, with a very sparse fringing of short stiff hair; palpi stout, attaining middle of front; tongue about as long as the body; antennæ with a small, abrupt, bent hook at the tip. Thorax smooth, moderately advanced

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in front of primaries. Abdomen very long, tapering gradually to a point, the segments armed posteriorly with spinules; vestiture very smooth, a narrow brush of fine hair at tip in the ♂. Tibiæ not spinose; median pair with unequal terminal spurs, posterior with terminal and middle spurs. Legs lengthening posteriorly, the hind legs much the longest and stoutest. Primaries narrow, proportionately small, apex acute, subfalcate, outer margin very oblique, inner margin sinuate; 12-veined, the venation presenting no peculiarity. Secondaries small and narrow, venation as usual, outer margin sharply produced on vein 1b, else even, apex pointed. The genitalia are very much as in *Darapsa;* there is no essential difference in the supra-anal plate and hook; the side piece is rather broad, a small, weak, slightly curved hook inferiorly near base.

This genus differs from all others of our American forms in the long, slender abdomen, and the comparatively short, narrow wings, the primaries subfalcate.

Two species are in our lists as North American; the common *C. tersa* of the East, and *C. procne* Clem., from Lower California. This latter species has never since been found in our territory. Mr. Hy. Edwards states that he never saw or heard of it in California. Butler says he thinks it an African form with an erroneous locality. Strecker figures a species which he says agrees with Clemens' description and which may have been Clemens' type, but he has no definite information in regard to its locality. Mr. Grote suggests that it may be *C. lucasii* from East India, and Mr. Maassen makes the reference positively. For the benefit of those desiring to investigate, I add the bibliography.

The only species really belonging to our fauna is *tersa*, and the genus is essentially a tropical one.

C. tersa Linn., Mant. Ins. ii, 538, *Sphinx:* Dru., Ex. i, 61, pl. 28, fig. 3, *Sphinx;* Westw., ed. i, 56, pl. 28, fig. 3, *Deilephila;* Fabr., Syst. Ent. 547, *Sphinx;* Sp. Ins. ii, 153, *Sphinx;* Mant., Ins. 2, 98, *Sphinx;* Ent. Syst. iii, 1, 378, *Sphinx;* A. & S.* Ins. Ga. i. 75, pl. 38, *Sphinx;* Cram., Ex. iv, 226, pl. 397, fig. C, *Sphinx;* Gmel., ed. Linn. S. N. 2379, *Sphinx;* Hüb., Verz. 135, *Theretra;* Harr.,* Sill. Journ. 36, 303, *Chærocampa;* Duncan,* Nat. Libr. 37, pl. v, fig. 1, and pl. vi, fig. 1, *Metopsilus;* Wlk., C. B. M. Lep. Het. viii, 131, *Chærocampa;* Burm., Sph. Braz. 61, *Philampelus;* Lucas in Sagra Cuba, 1856, 293, *Chærocampa;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 150, *Chærocampa;* Morr., Syn. 1862, 171, *Chærocampa;* H. S. Corr. Bl. 18, p. 58, *Chærocampa;* Grt., Buff. Bull. i, 22, *Metopsilus;* Bd.,* Sp. Gen. Het. i, 268, *Chærocampa;* Butl., Tr. Zool. Soc. Lond. ix, 563, *Chærocampa;* Fernald,* Sphing. 62, *Chærocampa;* Gundlach, Cont. Ent. Cuba 191, *Chærocampa;* Grt., Hawk Moths 30, *Deilonche;* Edw., Ent. Amer. 3, 165, *Chærocampa.*

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Head and thorax fawn brown, often with an olivaceous tint; palpi reddish beneath; a lateral whitish line often inclining to roseate, on head and thorax, patagiæ edged above with ferruginous brown. Abdomen with a broad, dorsal dusky band, containing five somewhat indefinite darker lines and a rusty yellow lateral band still less distinctly strigate. Primaries light brownish yellow, sometimes rich yellowish brown, somewhat purplish at the base, a dark smoky brown patch below the origin of vein 1. From the apex a series of from seven to nine darker brown, rather straight lines diverge toward the inner margin; a brown shade accompanies the inner lines, reaching the hind margin rather close to base; a yellowish shade from the extreme apex to the middle of the inner margin, broadening toward that point. The outer lines are rigidly parallel with the outer margin. A small blackish discal dot. Secondaries black, outwardly margined with brown; costal margin and anal angle yellow, and with a series of large wedge-shaped yellow subterminal spots. Beneath, disc purplish, outwardly ochreous with ferruginous powderings; an indistinct, interrupted oblique transverse line; a row of black venular dots, outer margin purplish; secondaries ochreous with ferruginous powderings; two purplish transverse bands; a row of blackish venular dots, not reaching the inner margin; outer margin purplish. Legs grayish. Abdomen with a series of small black stigmatal dots. Expands from 2.25—3 inches; 56—75 mm.

Hab.—Canada to Massachusetts occasional, southward to Texas, West Indies, Central and South America; westward to Iowa.

The most elegant and graceful of our species, varying only in the ground color. Its home is South and West, where it is common, but it ranges northwardly as far as Canada as an occasional visitant.

The larva was figured by Abbot, and subsequent authors have, apparently copied this figure and drawn their descriptions from it.

C. procne Clem., J. Ac. N. Sci. Phil. iv, 1859, p. 151, *Chærocampa;* Morr., Syn. 1862, 173, *Chærocampa;* Wlk., C. B. M. Mus. Lep. Het. Supp. xxxi, p. 30, *Chærocampa;* Grt., Buff. Bull. i, 22, *Metopsilus;* id. ii, 226; Edw., Pr. Cal. Ac. Sci. vi, 90, *Chærocampa;* Strk., Lep. 114, pl. xiii, fig. 10, *Chærocampa;* Butl., Trans. Zool. Soc. Lond. ix, 564, *Chærocampa;* id. 638, an sp. Afric.? Maassen. Stett. Ent. Zeit. 1880, v. 41, p. 57 = *C. lucasii;* Grt., Pap. ii, 170 = *C. lucasii* (East Indian)?

ARGEUS Hüb.

Verz. bek. Schmett. 134.

The differences between this genus and *Philampelus* are largely comparative, yet evident. The head is larger, more prominent; the eyes larger; antennæ more slender, and with a short hook at tip. The thorax is further advanced before the base of primaries, and the abdomen is larger and more slender. The wings, too, are somewhat more narrow, the secondaries with anal angle prominent, and as a whole the species are more graceful than in the other genus. The single species is hardly a native of the United States, though it often

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ranges as far north as New Jersey, and has been found in Canada and Racine, Wis., as an occasional visitant. Its striking green color will at once serve to identify the species, which is common enough in Mexico, West Indies and South America. I have seen many specimens, but could not get a single male fit for examination as to the genitalia.

The species is:

A. labruscæ Linn., S. N. ed. x, 491, *Sphinx;* ed. xii, 800, *Sphinx;* Mus. L. U. 352, *Sphinx;* Clk., Ic. t. 47, fig. 3, *Sphinx;* Cram., Pap. ii, p. 133, t. 184, fig. A, *Sphinx;* Fabr., Syst. Ent. 546, *Sphinx;* Sp. Ins. ii, 152, *Sphinx;* Mant., Ins. ii, 98, *Sphinx;* Ent. Syst. iii, 1, 377, *Sphinx;* Gmel., ed. Linn. S. N. 2380, *Sphinx;* Swain's Zool. ii, pl. 87, *Sphinx;* Hüb, Samml. 1, 167, *Eumorpha:* Verz. 134, *Argeus;* Wlk., C. B. M. Lep. Het. viii, 178, *Philampelus;* Burm.,* Sph. Braz. 2, *Philampelus;* Clem., Journ. Ac. N. Sci. Phil. 1859, 156, *Philampelus;* Lucas in Sagra 1856, p. 292, pl. 17, fig. 3, *Philampelus;* Morris, Syn. Lep. 1862, 178, *Philampelus:* H. S. Corr. Blatt. 1865, 58, *Philampelus;* G. & R., Pr. E. S. Ph. v, 158, *Philampelus;* Grt., Buff. Bull. i, 22, *Argeus;* Bd., Sp. Gen. Het. i, 193, *Philampelus;* Gundlach, Cont. Lep. Cuba, 186, *Philampelus:* Butl., Tr. Zool. Soc. Lond. ix, 578, *Philampelus;* Grt., New List, 1882, *Argeus.*

clotho Fabr., Ent. Syst. 540, *Sphinx;* Sp. Ins. ii, 152, pr. syn.; Ent. Syst. iii, 1, 376, an sp. dest.; Gmel., et Linn. S. N. 2380, pr. syn.

Head, thorax and primaries above, green, varying in shade. The centre of primaries is taken up with a V shaped deeper green space, the marginal lines strongly marked and inwardly shaded. Beyond this, are two parallel, somewhat deeper green lines which unite before reaching the internal margin. A series o small, brown, subterminal spots. A large, somewhat oval brown patch in the centre of the wing just beyond and somewhat encroaching on the darker median space. Secondaries blue, with a central black band, in which is a blue spot, the band margined with pink toward the internal margin to which the band does not extend. Another, submarginal black band, breaking up into a series of narrow lines toward the anal angle, where the wing is also tinged with pink. The outer margin is green. Abdomen somewhat paler, olive green, beneath with lateral white dots. Wings beneath yellowish, with two common transverse lines and a broad, very irregularly dentate dark outer band on both wings, disc of primaries toward base also dark. Expands 4.25—4.75 inches; 105—120 mm.

Hab.—South America, Mexico, West Indies, Northward from Florida to Canada, Wisconsin occasional.

As already stated this insect is only an occasional visitant, and so far as I am aware the larva has not been observed in the U. S. It has been described by Burmeister. The striking green color of primaries and prominent blue secondaries are very characteristic.

The colors are very sensitive to light, and often change to a dirty testaceous or luteous yellow. A fully colored fresh specimen is a beautiful insect.

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PACHYLIA Wlk.

C. B. M. Lep. Het. i, 189.

Body robust, heavy. Head large, free, rather prominent; eyes large, hemispherical, not lashed; palpi reaching the middle of front; thick, heavily clothed, so as to form a conic protuberance on front, tongue strong, about half the length of the body; antennæ fusiform, with a tapering, curved tip. Thorax smooth, stout, well advanced before base of primaries, narrowing anteriorly; vestiture rather loose at base. Abdomen moderate in length, cylindric, heavy, obtuse at tip, the segments posteriorly spinulose. Legs unarmed; increasing in length and strength posteriorly, median tibiæ with a pair of unequal terminal spurs; posterior tibiæ with two pairs of unequal spurs. Primaries well developed, apex acute, slightly excavate below, outer margin somewhat convex at middle; anal angle distinct, but hardly drawn out; inner margin sinuate. Venation of the usual type; vein 9 wanting. Secondaries with apex acute, outer margin obsoletely scalloped, somewhat produced on vein 1b; venation also of the normal type. The genitalia of the ♂ are peculiar; the supra-anal plate divides not far from base, forming two long, curved prongs, somewhat thickened in the middle and pointed at tip; the prongs are parallel, slightly divaricate at extreme tip. The side piece is short and broad, without a distinct clasper, but with a somewhat chitinous inferior process set with spinules near base. This structure would seem to ally the genus to the Bombycid type. In wing shape, and in most other details of structure, the genus is close to *Philampelus*. The form of the body, however, is distinctive, as is also the genital structure. The species are all large, rather obscure forms, and the genus is a tropical one. Our only species is Southern, and extends also into South America. It is:

P. ficus Linn., Syst. Nat. ed. x, 491, *Sphinx;* ed. xii, 2, 800, *Sphinx;* Mus. L. U. 353, *Sphinx;* Clk.,* Ic. pl. 49, fig. 2; Dru., Ex. ii, 44, pl. 26, fig. 1, *Sphinx;* Fabr.,* Syst. Ent. 540, *Sphinx;* Sp., Ins. ii, 145, *Sphinx;* Mant., Ins. ii, 95, *Sphinx;* Ent. Syst. iii, 1, 366, *Sphinx;* Gmel., ed. Linn. S. N. 2380. *Sphinx;* Westw., ed. Dru. ii, p. 48, pl. 26, fig. 1, *Sphinx;* Hüb., Verz. 134, *Pholus;* Wlk., C. B. M. Lep. Het. viii, 189, *Pachylia;* Burm.,* Sph. Brazil, p. 5, *Deilephila;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859. 158, *Pachylia;* Morr.,* Syn. 1862, 181, *Pachylia;* H. S., Corr. Blatt. 1865, 58, *Pachylia;* G. & R., Pr. E. S. Phil. v, 184, *Pachylia;* Bd., Sp. Gen. Het. i, 136, *Pachylia;* Butl., Tr. Zool. Soc. Lond. ix, 578, *Pachylia;* Gundlach, Cont. Ent. Cuba, 201, *Pachylia.*

Crameri Ménét En. An. Acad. Petrol. Lep. pt. ii, 133, *Chœrocampa;* Grt., Pr. E. S. Phil. v. 62, pr. syn.

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lyncea Clem., Journ. Ac. N. Sc. Ph. iv, 1859, 159, *Pachylia;* Morr., Syn. 1862, 182; Grt., Buff. Bull. ii, 150, pr. syn.; New List 1882? an sp. dist.

venezuelensis Schaufuss, Nunquam Otiosus, i, 16, 1870; Butl., Pr. Zool. Soc. Lond. ix, 578, pr. syn.

Dull luteous brown, varying to brighter, paler more yellowish or reddish brown. The vestiture at base of thorax is paler, more yellowish. Abdomen, laterally yellowish, extending toward the dorsum at the incisures; more distinctly so near base. Primaries marked and banded with darker, smoky brown; a large, semi-oval, pale, apical patch, pointed at the costal margin and apex. Basal space darker, beyond which is a transverse, sinuate and dentate line. At basal third is a series of three rather obscure, not entirely parallel transverse lines, accompanied by a deeper, more reddish shade; beyond this is another outwardly curved transverse line, dentate on the veins. From the pale apical patch a darker shade extends to the middle of the outer margin making it of a triangular form. Anal angle grayish. Discal spot distinct, with centre of ground color. Secondaries dull luteous, with a black central band, a broad black outer margin, not, however, reaching to the anal angle, and a narrow blackish line just above this margin, often obsolete towards the margins; the little projection at anal angle is pure white. Beneath uniform, rather bright reddish yellow, powdery. An extra discal darker line crossing both wings, and beyond this is a series of darker venular dots, also common to both wings; between the two there is often a more or less evident additional transverse line, visible only in bright specimens. Expands 4.25—5.25 inches; 1.06—1.30 mm.

Hab.—Florida, Texas, Central and South America.

This species is really an intruder in our fauna, belonging to a tropical type. It is decidedly variable in ground color, and in the distinctness of the maculation; in dark specimens the latter is often obscured and difficult to make out. The oval apical pale patch, however, and the yellow and black secondaries with the pure white anal angle render it a form easy of recognition.

It is one of the oldest known American insects. Madame Merian figures it in her "Insects of Surinam," and Clerck figures it in his "Icones."

Fabricius (Syst. Ent. 540) describes the larva from the figures, and says of it "*larva viridis, flavo lineata, capite caudaque nigris.*" It was said to feed on the Fig. Subsequent authors seem largely to have drawn their information from the same source, Boisduval, in 1874, referring to Madame Merian's figure and describing the larva as green, transversely striated with yellow, with the head, the first segment and the anal parts black. The horn is short and arcuated. Burmeister gives a more detailed description.

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PHILAMPELUS Harr.

Sill. Journ. 1839, v. 36, 286, 298.

Head rather large, free and prominent, smoothly scaled. Tongue about as long as the body; palpi ascending, pressed close to the front; eyes large, not lashed; antennæ slender, fusiform, ciliate in the ♂, simple in the ♀, with a regular curve at tip, or somewhat abruptly bent forming a curved hook. Thorax stout, untufted, moderately extended in front of the base of primaries. Abdomen large, cylindrical and tapering to a point, entirely untufted, the segments armed with spinules on the posterior margin. Tibiæ not spinose, the posterior longest and strongest; middle pair with two long, unequal terminal spurs, posterior with two pairs. Primaries with eleven veins, the arrangement of the typical form. Secondaries with the cross-vein closing the cell obliquely sinuate; 5 much nearer to 4 than 6; 3, 4 and 5 nearly equidistant. Primaries with the outer margin entire, obliquely rounded, or somewhat excavate between the apex and the end of vein 4, the sexes differing somewhat in this point. Secondaries slightly produced on vein 1b, elsewhere entire.

The supra-anal plate of the ♂ is trigonate, depressed above; the hook is slender, elongate, acute at tip; the inferior process stouter, about half the length of the superior process. The side pieces are rather variable in form, the tip always obtusely rounded; a single, rather short, stout, curved, abruptly pointed hook at the middle of the inferior margin, forms the clasper.

The genus is very readily distinguished by the curved antennæ, large size, the somewhat pointed primaries, and the produced anal angle of the secondaries. The larvæ have the head small and globose, the anterior segments attenuated and retractile into the third which is much swollen. The anal horn is wanting in the mature larva, its place indicated by a shining lenticular tubercle. They are clumsy looking, and in repose, or when disturbed, the anterior segments are retracted into the third, causing it to appear truncated or bulbous anteriorly, and at the same time the body is thrown into the typical *Sphinx* posture.

The transformations are subterranean. The pupa is cylindriconic, head-case distinct or prominent, tongue-case not apparent.

The larva are all vine feeders, and are not uncommon. Those of *achemon* and *pandorus* have an economic importance, and the

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larvæ have been carefully figured in all stages by Prof. Riley. These figures have been used again and again until the larvæ are about as well known as any.

We have four species belonging to our fauna—*posticatus* being excluded as not referable thereto; *satellitia* and *lycaon* are also excluded as not synonymous with *pandorus*.

Primaries with a longitudinal band from base to apex and an oblique transverse band from middle of inner margin to costa before apex; ground color olive green.

Outer margin of secondaries fuscous, except at anal angle; larger, primaries broader.....**linnei.**

Outer margin of secondaries pinkish red; smaller, primaries narrower..**vitis.**

Primaries without the bands above described.

Ground color olive green, secondaries very pale bluish green on disc. **pandorus.**

Ground color very pale fawn gray; secondaries red on disc.....**achemon.**

There are two distinct types of maculation. *Vitis* and *linnei* agree in the ground color of olive green, with a broad longitudinal pale streak, crossed by one of the same nature from the middle of inner margin to the costa near the apex. *Linnei* is larger, broader winged, more sordid in appearance; the outer margin of secondaries not red, except at anal angle; *vitis* is smaller, narrower winged, the outer margin less arcuate, maculation much more distinct; the secondaries have the outer margin pink.

Pandorus and *achemon* lack the stripes; they have a somewhat triangular spot before the apex on costa, another near the anal angle on inner margin; a quadrate patch at about the middle of inner margin and a rather larger, more diffuse shade from costa beyond middle, extending downward to about vein 3. *Pandorus* has the ground color a very pale olive green, while *achemon* has it reddish or fawn gray. The species are thus very distinct, irrespective of any structural difference.

P. linnei G. & R., Pr. Ent. Soc. Phil. v. 157, 179, 182, pl. 2. fig. 3, *Philampelus;* Grt., Buff. Bull. i, 21, *Dupo;* Strk., Lep. Rhop. et Het. 140, *Philampelus;* Butl., Tr. Zool. Soc. Lond. ix, 574. *Philampelus;* Gundlach, Cont. Ent. Cuba, 191, *Philampelus;* Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 58 = *vitis* Linn.; Grt., Hawk Moths 32, *Philampelus.*

vitis ‡ Cram., Ex. iii, 138, pl. 268, fig. E, *Sphinx;* Hübn., Verz. 137, *Dupo;* Wlk., C. B. M. Lep. Het. viii, 176, *Philampelus;* Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 156, *Philampelus;* Morris, Syn. 1862, 179, *Philampelus;* H. S., Corr. Bl. 1865, 58, *Philampelus;* G. & R., Pr. Ent. Soc. Phil. v, 157, pr. syn.; Bd., Sp. Gen. Het. i, 200.

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fasciatus ‡ Grt., Pr. E. S. Phil. v, 59, 84, *Philampelus;* G. & R., Pr. E. S. Ph. v, 157, pr. syn.

The head, thorax and abdomen are of a pinkish gray above and beneath. A diffuse line along the middle of head and thorax, and a large triangular spot on the thorax olive green. A spot on each side of the abdomen and a broad, longitudinal stripe each side of the middle, brown of a variable shade, usually rather light reddish. Primaries bright olive green, with a pale flesh colored or fuscous stripe from the middle of base to the apex, and crossed by a similar one which extends from the middle of the inner margin to the outer fourth of costa, leaving a triangular spot of olive green on the outer part of costa. This oblique stripe has two imperfect brown lines running through it. Terminal space paler, fuscous, or purplish flesh color, inwardly limited by a more or less defined paler line. Discal spot small, black, margined with fuscous. Veins 2, 3 and 4 light flesh color where they cross the green. A broad, basal, transverse band, often obsolete above the median fascia and varying from pale flesh color to dull fuscous. Secondaries light green; a large rose colored space on anal angle and along internal margin; a large rectangular spot within; two narrow median lines; the inner black, most distinct, joining the large black spot at the outer inferior angle; the outer faint, glaucus, contiguous to subterminal band, bent before anal angle; a broad, subterminal black band, widest at costa, narrowing to anal angle, before which it is suddenly constricted; terminal space narrow, nowhere pinkish, obscure brownish; external margin more rounded than in *vitis*. Expands 3.25—4.50 inches; 81--1.12 mm.

Hab.—Atlantic region from Massachusetts to Florida; Cuba; South and Central America.

This species is variable, principally in intensity of maculation. In fresh specimens the green is quite bright, and the reddish or flesh colored tinge in the pale markings of primaries is distinct; in old specimens the red fades out and the green becomes sordid, often yellowish, decidedly changing the aspect of the species. There is little variation in the maculation, which is characteristic and easily recognized. It could only be confused with *vitis*, and from that the secondaries separate it at a glance, as above mentioned.

The genitalia of the ♂ differ from the others in the longer corneous and somewhat less curved clasper, ending in an obtuse point; the side piece is very similar to that of *pandorus* and *vitis*, the difference being in the clasper.

The larva of this species has not been recognized as yet. It will probably be found to resemble that of *vitis* quite closely.

Vitis and *linnei* have been very generally confused by earlier writers and considered identical. Messrs. Grote & Robinson have given a very full history of the two forms in the Proc. Ent. Soc. Phil. v, 179, satisfactorily straightening out the confusion theretofore existing. It will be sufficient to refer the student to this bit of careful

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study, and to note my full concurrence in their views. It will be as well to note, however, that as a rule the German entomologists do not agree in the results of this study. Maassen's criticisms in Stett. Ent. Zeit. 1880, v. 41, p. 58, being quite rabid.

P. vitis Linn., Syst. Nat. ed. x. 491, *Sphinx;* ed. xii, 801; Mus. L. U. 354, *Sphinx;* Dru., Ex. i, p. 60, pl. 28, fig. 1, *Sphinx;* Westw., ed. i, 54, pl. 28, fig. 1, *Sphinx;* Fabr., Syst. Ent. 542, *Sphinx;* Sp. Ins. ii, 147, *Sphinx;* Mant., Ins. ii, 96, *Sphinx;* Ent. Syst. iii, 1, 369, *Sphinx;* W. Verz. p. 47, *Sphinx;* Cram., Ex. iii, 136, pl. 267, fig. C, *Sphinx;* S. & A.,* Ins. Ga. i, 79, pl. 40, *Sphinx;* Gmel., ed. Linn. S. N. 2381, *Spninx;* Hüb., Verz. 137, *Dupo;* Harr.,* Sill. Journ. 36, 299, *Philampelus;* Burm., Sph. Braz. p. 3, *Philampelus;* Clem.,* Journ. Ac. N. Sci. Phil. 1859, iv, 156, larva; Grt., Pr E. S. Ph. v, 58, 83, *Philampelus;* G. & R.. Pr. E S. Ph. v, 179, 181, *Philampelus;* Grt., Buff. Bull. i. 21, *Dupo;* Butl., Tr. Zool. Soc. Lond. ix, 574, *Philampelus;* Koebele,* Bkln. Bull. iv, 22; Fernald, Sphing. 57, *Philampelus;* Gundlach, Cont. Ent. Cuba, 188, *Philampelus;* Grt., Hawk Moths 32, *Philampelus;* Edw.,* Ent. Amer. iii, 165.

jussieuæ Hüb., Saml. Ex. i, pl. 169, *Eumorpha;* ii, pl. 376, *Dupo;* Verz. 137, *Dupo;* Wlk., C. B. M. Lep. Het. viii, 177, *Philampelus;* Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 157, *Philampelus;* Morr., Syn. 1862, 180, *Philampelus;* Grt., Pr. E. S. Ph. v, 83, pr. syn.

fasciatus Sulz., Abk. Gesch. Ins. 151, pl. 20, fig. 1, *Sphinx;* Hüb., Verz. 137, pr. syn.; H. S. Corr. Bl. 1865. 58, *Philampelus;* Grt., Pr. E. S. Ph. v, 83, pr. syn.; Bd., Sp. Gen. Het. i, 202, *Philampelus;* Maassen, Stett. Ent. Zeit. 1880, v, 41, p. 58, an sp. dist. *vitis.*

Smaller, and the maculation more sharply defined than in *linnei;* the primaries are narrower and more acute, the outer margin scarcely rounded. The maculation is essentially like that of *linnei*, but the colors are deeper, and the contrasts, therefore, greater. There is less suffusion, and the bands are more rigid. The secondaries show greater differences; they are dull pale greenish inwardly. Along the external margin, from costal angle to the medio-posterior nervule, is a broad, terminal, pink band, within which a broad black fascia, interrupted by greenish scales on the nervules and terminating below medio-posterior nervule in two narrow lines, outside of which latter is a brownish square space above anal angle. Internal margin and anal angle largely pink; two large black dots below the disc, merely separated by a few pink scales; a few white scales within the terminal black lines above anal angle. Expands 3—4.25 in.; 75—106 mm.

Hab.—Florida, Texas, along Atlantic coast to Massachusetts, South and Central America, Cuba.

The genitalia of the ♂ are essentially like those of *pandorus*, save that the clasper is slenderer and more curved.

As with *linnei*, this species shows comparatively little variation. There is the usual tendency to fade, which will account for most of the apparent differences. The bands on this species are much more

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sharply defined, and the basal band is not often distinct above the median stripe; often it is a mere upright, white line. The pink outer margin of secondaries is characteristic of the species.

The larva has been figured by Abbot, and prior to that by Madame Merian. Clemens and Morris describe it in somewhat different terms, but I am unacquainted with any complete life history.

P. pandorus Hübner, Samml. Ex Schmett. ii, pl. 374, *Daphnis;* Wlk., C. B. M. Lep. Het. viii, 174, *Philampelus;* Lint.,* Pr. E. S. Ph. iii, 659, larva; Beth.,* Can. Ent. i, 11: Saund.,* Can. Ent. i, 26; Bd., Sp. Gen. Het. i, 197, *Philampelus;* Butl., Tr. Zool. Soc. Lond. ix, 575, *Philampelus;* Saund.,* Fruit Ins. 249, figs. 258, 259; Fernald,* Sphing. 59, pl. iii, figs. 1 and 2, *Philampelus;* Grt., Hawk Moths 33.

satellitia ‡ Harr.,* Sill. Journ. 36, 299, *Philampelus:* Clem.,* Journ. Ac. N. Sc. Phil. iv, 1859, 154, *Philampelus;* Morr.,* Syn. 1862, 176, *Philampelus;* Harr.,* Inj. Ins. Flint ed. 325, pl. v, fig. 2, *Philampelus:* Grt., Pr. E. S. Phil. v, 61, 84, pr. syn.; Riley,* Am. Ent. ii, 89, figs. 58, 59, larva; 2d Mo. Rep. 76, figs. 52, 53; Bd.,* Sp. Gen. Het. i, 196, *Philampelus;* Saund.,* Can. Ent. xii, 41, figs. 4, 5, *Philampelus;* Scudder,* Psyche ii, 68.

ampelophaga Bdv. mss.; Wlk., C. B. M. Lep. Het. viii, 174, pr, syn.; G. & R., Tr. A. E. S. ii, 76, pr. syn.

Upper side with a ground color of very pale olive green, with spots and shades of rich or deep olive green. Palpi brownish at base. Head and thorax with a narrow dark dorsal line; patagiæ olive green, forming a triangular patch at each side of thorax and the latter also olive marked at base. Abdomen with a brownish tinge; a rich olive dorsal patch at base and a blackish patch each side; a somewhat indefinite, paler dorsal line. Primaries with a large olive green spot on the middle of the inner margin, connected by a somewhat paler olive shade with the base of the wing. A triangular spot of green rests on the inner margin just within the anal angle; between these two spots resting on the inner margin the space is shaded with rosy scales, very distinct on veins 2 and 3. A somewhat trigonate olive patch on costa just before apex, below which a yellowish shade gradually loses itself in the ground color towards the middle of the subterminal space. A somewhat more diffuse and less distinct olive shade extends outwardly from middle of costa and downward nearly to vein 3, sending a spur along this vein to the outer margin. A series of three wavy, transverse lines before the middle, visible only through the paler costal region; a series of three angulate and sinuate transverse lines beyond the middle, faintly marked through the pale space on inner margin. Discal spot consisting of two or three small black spots at the end of the cell. Secondaries very pale green basally; a large roundish black patch at middle of inner margin; a broad black subterminal half band, breaking up at the inner half of its course into a series four or five lines on a roseate ground; outer margin olive green. Beneath luteous; primaries with outer margin olivaceous gray, the shade very distinctly margined inwardly; two somewhat bent darker transverse lines beyond the middle; a darker shading along internal margin. Secondaries paler along inner margin; two very distinct parallel transverse darker lines. Expands 3.75 -4.50 inches; 95—112 mm.

Hab.—United States east of the great plains; Canada.

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This species is easily distinguished by the characters above pointed out. It is not uncommon, becoming more rare, however, northwardly.

The side pieces of the ♂ are moderately long and broad, somewhat curved, the tip broadly rounded; the clasper is rather short, stout, narrowing rather rapidly to a point, somewhat curved.

There is little variation in this species save in the distinctness of the shades and in the amount of rosy shading in the primaries. The green of the primaries fades readily into a sordid luteous.

The larva being of some economic importance has been frequently figured and described. Harris first gave a tolerably complete life history and figures of this species, and Prof. Riley has also figured and described the various stages.

P. achemon Dru., Ex. ii, 51, pl. 29. fig. 1, *Sphinx;* Westw., ed. ii, 55, pl. 29, fig. 1, *Sphinx;* St. Farg., et Serv. Enc. Mèth. x, 441, *Smerinthus;* Harr.,* Sill. Journ. 36, 300, *Philampelus:* Inj. Ins. Flint ed. 325, figs. 150, 151, pl. v, fig. 3; Wlk., C. B. M. Lep. Het. viii, 174, *Philampelus;* Clem.,* Journ. Ac. Sci. Phil. iv, 1859, 155, *Philampelus;* Morr.,* Syn. 1862, 177, *Philampelus;* Lint.,* Proc. E. S. Ph. iii, 661; G. & R., Pr. E S. Ph. v. 184, *Philampelus;* Riley,* Am. Ent. ii, 54, figs. 33 35, all stages; 2d Mo. Rep. 74, figs. 49–51, all stages; Harr.,* Ent. Corr. pl. iii, fig. 11, larva; Lint.,* Ent. Cont. ii. 117; Saund.,* Can. Ent. x, 101, figs. 4–6; Butl., Tr. Zool. Soc. Lond. ix, 575, *Philampelus;* Behr., Pap. ii, 2, *Philampelus;* Saund.,* Fruit Insects. 250, figs. 260–262; Fernald,* Sphing. 60, pl. iv, figs. 1 3; Grt., Hawk Moths 34.

crantor Cram., Pap. Ex. ii, p. 11, pl. 104, fig. A, *Sphinx;* Fabr., Sp. Ins. ii, 151, *Sphinx;* Mant., Ins. ii, 197, *Sphinx;* Ent. Syst. iii, 1, 375, *Sphinx;* Sm. & Abb., Ins. Ga. i, 81, pl. 41, *Sphinx:* Hüb., Verz. 134, *Pholus;* St. Farg., et Serv. Enc. Mèth. pl. 66, fig. 9, *Sphinx;* Westw., ed. Dru. Ex. ii, 54, pr. syn.; Bd., Sp. Gen. Het. i, 199, *Philampelus.*

Head, thorax and primaries above grayish fawn, or red ash color, with the maculation and shadings brown. Palpi, except at tip, brown. Patagiæ rich deep brown, forming a somewhat trigonate patch on each side. Abdomen somewhat darker dorsally, laterally near base with a roseate tint; segments narrowly edged with white posteriorly. Primaries with a brown dot near base; a quadrate deep brown patch at middle of inner margin: a small, trigonate patch of the same color just before anal angle, and a larger, also trigonate, patch before apex; a dusky shade from the middle of costal margin outward and downwardly as in *pandorus;* terminal space dusky. The transverse lines are as in *pandorus*, but more distinct. Secondaries pink, with a reddish ash colored outer border, which has a row of elongate deep brown spots along its inner edge not clearly defined in the basal half of the series, and there is a diffuse, dark reddish spot above the anal angle. Beneath, primaries rosy red, with a broad ash colored outer margin, which is inwardly dentate, and two parallel, somewhat rivulous, transverse, deeper brown lines. Secondaries powdery, with two parallel transverse lines. Expanse 3.75—4.25 inches; 95—106 mm.

Hab.—Canada; United States from Atlantic to Pacific.

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This is at the same time the handsomest and most widely distributed of our species of this genus; it is found everywhere where the grape grows, but is rarely abundant enough to do mischief, though it figures in the literature of economic entomology.

The side piece of the ♂ is shorter and broader than in *pandorus*, and there is a decided enlargement at the insertion of the clasper, which is more curved and somewhat longer than in *pandorus*.

There is little variation in the imago, which is so different in color from the others of the genus as to be readily recognizable.

The early stages of this species are also well known. Prof. Riley has figured the larva and imago, and these figures have been freely used by others, and Mr. Lintner has given, perhaps, the most completely written history of the species.

AMPELOPHAGA Brem. & Grey.

Beitr. Schmett. Fauna nord. Chin. 1853, p. 11.

Head small, the vestiture forming a central ridge or tuft between the antennæ; tongue about half the length of the body; palpi moderate, curving up and rather closely applied to the front; eyes moderate in size, and slightly lashed; antennæ slim, fusiform, the tip attenuated and prominently curved or hooked, biciliate in the males simple in the females. Thorax short and stout, but little advanced in front of the base of primaries, untufted, vestiture smooth. Abdomen large, cylindrical, tapering rather suddenly on the last segments; without anal or side tufts, segments without spinules along the hinder edge; some specimens have a few fine spinules; tibiæ not spinose, except in *chœrilus*, which has the fore and middle pairs sparsely spinose; middle tibiæ with one pair of comparatively long, unequal spurs, the hind tibiæ with two pairs. Primaries with eleven veins (10 wanting), not differing in pattern from the family type; apex falcate, outer margin excavate from apex to vein 4 and rounded beyond. Secondaries with the typical venation; outer margin excavate between veins 1b and 3, but nearly straight beyond this to the apex. Costa of all the wings arcuate. Frenelum and loop present in the males, the loop wanting in the females, the frenelum reduced to a bunch of bristles.

The genitalia of the males are all of one type, differing only in minor characters in the species. The side piece is short and broad, irregularly oval in shape, with a variously formed, small corneous

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clasper at its inferior margin. The supra-anal plate is small, trigonate, the hook short, broad, flattened above and somewhat reflexed at the side margins, not much curved; the inferior process flattened, trigonate, but little shorter than the superior.

The characterization of the genus, except as to the genitalia, is largely taken from Prof. Fernald's paper on Sphingidæ of New England, and the shorter note in Ent. Am. ii, 2,—it having been found correct in all essentials. I united *Ampelophaga* and *Darapsa* under the later term in my synopsis of genera. The term *Darapsa* had been previously restricted to a West Indian form not congeneric with our species, and Prof. Fernald uses Boisduval's term *Everyx* for our species. Bremer and Grey's generic term, however, has priority of both Boisduval's and Walker's, and Butler says that *versicolor* is perfectly congeneric with the typical species, while he leaves *myron* and *chærilus* in the Hübnerian genus *Otus*. Hübner's term, however, is pre-occupied. Fernald pointed out the spinulation in the tibiæ of *chærilus*, and Mr. Grote thereupon separates that species from *versicolor* and *myron*, which he calls *Ampelophaga*, under the term *Everyx*.

The spinulation of the tibiæ is so slight and so unimportant a feature in view of the general agreement in all stages that the separation seems hardly justifiable.

The species are all Eastern, and mostly double brooded. They are all occasionally attracted to sugar and light.

The species may be divided as follows:

Anterior and middle tibiæ spinose.....**chærilus.**
Tibiæ not spinose.
Under side of primaries reddish and gray without yellow markings..**myron.**
Under side of primaries green, with yellow markings.....**versicolor.**

A. chærilus Cram., Ex. iii, 91, pl. 247, fig. A, *Sphinx;* Hüb., Verz. 142, *Otus;* St. Farg. & Serv., Enc. Méth. x, 441, *Smerinthus;* Harr.,* Sill. Journ. 36, 302, *Chærocampa;* Wlk., C. B. M. Lep. Het. viii, 182, *Darapsa;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 147, *Darapsa;* Morr.,* Syn. 1862, 168, *Darapsa;* Grt., Pr. E. S. Ph. v, 81, *Otus;* Grt., Buff. Bull. i, 22, *Darapsa;* Beth., Can. Ent. i, 10, *Otus;* Hulst,* Bkln. Bull. ii, 35; Bd.,* Sp. Gen. Lep. Het. i, 210, *Everyx;* Grt., Buff. Bull. iii, 222, *Everyx;* Butl., Tr. Zool. Soc. Lond. ix, 545, *Otus;* Edw.,* Pap. iii, 126, *Everyx;* Fernald,* Sphing. 64, *Everyx;* Grt., Hawk Moths 30, *Everyx.*

clorinda Martyn, Psyche, pl. 25, figs. 66-67, 1797, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 545, pr. syn.

azaleæ Sm. & Abb.,* Ins. Ga. i. 53, pl. 27, *Sphinx;* Harr., Sill. Journ. 36, 302, pr. syn.

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Head and thorax above rust red, varying to brown red, with the tips of the patagiæ and a spot at the base of primaries pale gray. Abdomen fawn colored, varying somewhat in shade, the segments narrowly edged with pale yellowish. Primaries reddish brown with purplish reflections. The basal half is sprinkled with grayish scales and crossed by four curved brownish lines; a small brown discal dot. Outer portion of wing darker reddish brown, crossed by several indistinct paler lines, the inner edge being oblique and straight. Terminal space of the same color as the base of wing. Secondaries rusty brown. Beneath, pale rusty brown with indistinct terminal bands and two faint transverse lines on all wings. Expands 2.25—3.25 inches; 56—81 mm.

Hab.—Canada to Georgia; westward to Missouri, Iowa.

The species is readily recognizable not only by its spinose tibiæ, but also by the red brown thorax; that of the other species being more or less green. The genitalia are as described in the generic heading, the clasper a very small, slender, corneous hook, but slightly curved at the tip and somewhat obtuse. The species is not uncommon, the larva was first made known by Abbot and Smith, and has been more or less completely described by various authors since that time.

A. myron Cram., Ex. iii, p. 91, pl. 247, fig. C, *Sphinx;* Hüb., Verz. 142, *Otus;* St. Farg. & Serv., Enc. Mèth. x, 441, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii, 183, *Darapsa;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 147, *Darapsa;* Morr.,* Syn. 1862, 168, *Darapsa;* Lint.,* Pr. E. S. Phil. iii, 663, larva; Grt., Pr. E. S. Ph. v, 81. *Otus;* Beth., Can. Ent. i, 10, *Otus;* Riley,* Am. Ent. ii, 22, figs. 12-15, life hist.; Saund.,* Can. Ent. iii, 66, figs. 25-27, life hist.; Grt., Buff. Bull. i, 22, *Darapsa;* Bd., Sp. Gen. Het. i, 209, *Everyx;* Hulst, Bkln. Bull. ii, 35; Grt., Buff. Bull. iii, 222, *Everyx;* Butl., Tr. Zool. Soc Lond. ix, 546, *Otus;* Saund.,* Fruit Ins. 244, figs. 253-257, *Darapsa;* Fernald,* Sphing. 65, pl. v, figs. 1-3, *Everyx;* Grt., Can. Ent. xviii, 132, *Ampelophaga;* Hawk Moths 30, *Ampelophaga.*

pampinatrix Sm. Abb.,* Ins. Ga. i, p. 55, pl. 28, *Sphinx;* Harr.,* Sill. Journ. 36, 301, *Chærocampa;* Wlk., C. B. M. Lep. Het. viii, 183, pr. syn.; Harr.,* Inj. Ins. Flint ed. 327, figs. 152-154, et pl. v, fig. 4, life hist., *Chærocampa:* Morris in note l. c. syn. pr.; Grt., Pr. E. S. Phil. iii, 93; Riley,* 2d Rep. 71, figs. 44-47, all stages; Pack.,* Com. Ins. 57, figs. 47 and 48.

Var. **cnotus** Hüb., Zutr. 161, figs. 321-322, *Otus;* Morr. note to Harris' Inj. Ins. Flint ed. 327, pr. syn.; Grt., Pr. E. S. Ph. v, 81, pr. syn.; Buff., Bull. ii, 226, pr. var.

Head, palpi and thorax of a dark olive green, with a dull reddish triangular spot posteriorly on thorax and a pale, ash colored stripe on the side, over the base of the wings. The abdomen is dull greenish, with dull reddish reflections. Primaries of an olive gray color, with a curved olive green oblique band crossing at basal third; a brown discal point; a second oblique band starts from the outer third of the costa and crosses to the middle of hind margin. This band is nearly obliterated in the middle. The outer part of the wing is shaded with olive green

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at the apex and the anal angle, leaving the rest of the terminal space olive gray. Secondaries dull red, with a darker, more or less complete terminal band, which is greenish towards the anal angle. Beneath, the primaries are pale reddish, except the costa and outer border, which, together with the secondaries and body, are greenish gray; there is a central slightly darker median band on secondaries. These colors vary in intensity, and the maculation varies in distinctness. Often there is considerable suffusion of the primaries and this form, which is rather more common southwardly, is the *cnotus* of Hübner. Often the reddish suffusion becomes predominant, and the insect resembles *chærilus* quite strongly. The more rigid transverse bands of *chærilus* will, however, always prevent confusion. Expands 2.10—2.50 inches; 53—62 mm.

Hab.—Canada to Georgia; westward to Missouri, Iowa.

The clasper of the ♂ of this species is rather short and broad, with a rather large, spoon-shaped tip. Otherwise as in *chærilus*.

This insect is rather common, and is the form most frequently taken at sugar.

Its larva is of some economic importance, as it feeds on grape, and since Smith and Abbot it has been frequently figured and described.

A. versicolor Harr., Sill. Journ. 36, 303, *Chærocampa;* Inj. Ins. Flint ed. 328, *Chærocampa;* Wlk., C. B. M. Lep. Het. viii, 131, *Chærocampa?;* Clem., Journ. Ac. N. Sci. Phil. iv. 148, *Darapsa;* Morr., Syn. Lep. 1862, 169, *Darapsa;* G. & R., Pr. E. S. Phil. v. 154, *Otus;* List. Lep. 1868, *Darapsa;* Beth., Can. Ent. i, 10, *Otus;* Edw., Can. Ent. ii, 134, *Darapsa;* Grt., Buff. Bull. i, 22; id. ii, 226, *Darapsa;* Strk., Lep. Rhop. et Het. 113, pl. xiii, fig. 9, ♂; id. p. 142, *Darapsa;* Peck., Can. Ent. viii, 239, *Darapsa;* Bd., Sp. Gen. Het. i, 284, *Chærocampa;* Butl., Trans. Zool. Soc. Lond. ix, 546, *Otus;* id. 637, *Elibia;* Grt., Buff. Bull. iii, 222, *Elibia;* Hulst,* Can. Ent. x, 64, life hist.; Bkln.* Bull. ii, 351, *Darapsa;* Bunker,* Can. Ent. x, 211; Butl., Pap. i, 104, *Ampelophaga;* Grt., New List, 1882, *Ampelophaga;* Fernald,* Sphing. 67, *Everyx;* Fischer,* Can. Ent. xvii, 78; Holland,* Can. Ent. xviii, 104, *Everyx;* Grt., Hawk Moths 30, *Ampelophaga.*

Head and thorax dark green, varied with greenish yellow; the abdomen greenish yellow or buff, varied with darker green, especially along the middle andon the hinder edge of the segments. There is a whitish line along the side of the head and thorax over the base of the wings, and a dorsal line extending from the head to the tip of the abdomen. The collar and patagiæ are edged with white. Primaries green, of various shades; a deeper curved shade band from costa beyond middle to inner margin at basal third. A series of three curved white lines from costa to the base of the wing, ending in a grayish blotch: the lines are sometimes distinct throughout, but more usually the lines become olive gray below the median vein. Often the space between the second and third of these lines is darker. At the inception of the third line on costa is a pale shade, variable in extent toward the middle of the wing, but reaching to the shade band above described, and which is margined inwardly with white to the middle of the wing, the white gradually shading into olive gray. At about the outer fourth is another series of three whitish transverse lines running nearly parallel to the outer margin. The first runs into the second before the middle of

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the wing; the others reach the internal margin. An oblique white mark from apex to the outer whitish transverse line above the middle, broadening on the veins, which are marked on either side for a short distance. A darker blotch between this oblique line and the outer pale line between veins six and seven. Secondaries reddish or rusty brown, inner margin greenish gray, outer margin narrowly and often indistinctly green; fringes white. Beneath, primaries dull reddish on disc, the costa and outer margin green, marked with yellow and white, imperfectly reproducing the maculation of upper side. Secondaries shaded with green, yellowish and white. Expands 2.75—2.90 in.; 68—72 mm.

Hab.—Canada to Maryland; westward to the Mississippi.

The side piece, unlike the others of the genus, is somewhat spinulose inwardly; the clasper is comparatively long and slender, somewhat curved and pointed.

At once our rarest and most beautiful species of the genus. It is seldom taken, but not difficult to rear. The larva is greatly infested by parasites, and this may account to some extent for the rarity of the imago.

Mr. Hulst gives a complete life history in "Can. Ent." x, 64.

SPHINGINÆ.

This subfamily is distinguished by usually rather graceful form, with narrow wings, the primaries not sinuate nor angulated, but either evenly oblique, or slightly convex. The body is robust, the head usually distinct; their eyes are often small and lashed, and except in *Ellema*, the tongue is long and strong; some of the species of this subfamily representing the extreme of development in this direction. The palpi seldom are as prominent as in the *Chærocampinæ*, and often very short. The legs are very variable in length, strength and proportion, and also in armature. There is a very general tendency towards spinose tibiæ and armed fore tarsi; few species not being so distinguished. The venation is typical and offers nothing more than has been already described. There are very generally only eleven veins present.

In ornamentation this group shows a decided agreement in some few points. The abdomen is almost universally banded or laterally spotted—an exceptional character in the *Chærocampinæ*—the tendency is to gray or brown shades of ground color with longitudinally strigose markings or uniform transverse lines or mere dashes, while in the *Chærocampinæ* the tendency is to bright colors and broad shades or bands as markings. These peculiarities in marking and the wing form enable the student to recognize a species of this subfamily at once.

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There has been some difficulty in dividing this subfamily. A few of the genera there is no trouble with, such as *Amphonyx*, *Dilophonota* and *Cautethia*, and these I place at the head of the series.

Amphonyx contains one of the largest of our American species, and the genus is easily recognizable by the prominent head, large, unlashed eyes, untufted thorax and the peculiar naked hooked terminal joint of palpi, which look like a pair of small horns out of the vestiture of the head.

Dilophonota shares this latter peculiarity in some species, in a much less marked degree, but is evidently distinct by the thoracic divided crest, which is unique in the subfamily.

Cautethia contains a single small species with prominent head and eyes, untufted thorax and body, and unarmed legs. The secondaries are reddish or orange.

The remainder of the genera offer no salient characters, except in *Ellema*, which has the tongue obsolete. The characters here used are primarially the lashed or unlashed eyes, an extremely uncertain character; the armature of the legs, which here is unreliable and very variable, and some slight differences in the wing form. A reference of all the species to the genus *Sphinx* would not be indefensible, and it becomes a mere question of the desirability of subdivision. Prof. Fernald places *S. plebeius* in *Hyloicus*, and yet cannot quite satisfy himself that it is not congeneric with *Phlegethontius*. Species not seen by Prof. Fernald, however, make a connection with *Sphinx* complete, while the only things separating *Ceratomia* from *Hyloicus* are the unlashed eyes and slightly retracted head, characters in which *cupressi* forms almost the exact intermediate. It is, therefore, nothing at all but a question of convenience. The order of arrangement is similarly complicated by forms like *hylæus*, which are somewhat aberrant wherever placed. After due consideration the following scheme seems not unnatural:

First in the series might come *Protoparce*, with rather distinct or prominent head, unlashed eyes, very long tongue, sparsely or non-spinose fore tibiæ and armed fore tarsi.

To this *Sphinx* will join naturally. The eyes are smaller, head more retracted, eyes lashed, anterior tibiæ always, middle tibiæ generally, spinose, fore tarsi variable as to armature.

Dolba is sphingiform in appearance and has similarly lashed eyes, differing in the entirely non-spinose legs. It bears a superficial resemblance in ornamentation to *Protoparce rustica*, but is very much smaller.

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Chlœnogramma, with *jasminearum* as the type, agrees with *Dolba* in the unarmed legs, but has the eyes not lashed, and is, as a whole, more sphingiform in appearance.

Ceratomia has a retracted head, rather short tongue, not lashed eyes, non-spinose fore-legs and armed fore-tibia. The outer margin of primaries is somewhat retracted above the anal angle, marking that point. In structure it most nearly resembles the *Hyloicus* section of *Sphinx*, but the species have a somewhat distinctive habitus, not the least of which is due to the distinct transverse maculation of the primaries.

Finally, as nearest relatives of the *Bombycidæ* come *Ellema* and *Exedrium*, with weak, short tongue, but otherwise sphingiform habitus. *Exedrium* seems to differ by the unusually rounded wings, giving the insect quite a bombyciform appearance.

In the form of a synopsis the genera would be separable as follows:

§ *Tongue long and strong.*

1. Head large, prominent; eyes not lashed.....2.
   Head smaller, never prominent somewhat retracted; eyes variable.....3.
2. Palpi with terminal joint naked, prominent; thorax untufted; secondaries partly semi-transparent; legs unarmed.....**Amphonyx.**
   Palpi with terminal joint rarely naked; thorax with a prominent divided crest; legs unarmed.....**Dilophonota.**
   Palpi normal; thorax untufted; size very small; secondaries orange at base; legs unarmed.....**Cautethia.**
   Anterior tarsi armed outwardly with longer spinules; anterior tibiæ usually spinose.....**Protoparce.**
3. Eyes lashed.....4.
   Eyes not lashed.....5.
4. Tibiæ spinose; anterior always; median usually; anterior tarsi usually armed with longer spines.....**Sphinx.**
   Tibiæ not spinose; tarsi unarmed.....**Dolba.**
5. Legs unarmed.....**Chlœnogramma.**
   Anterior tarsi outwardly armed with long claws; tibiæ not spinose. **Ceratomia.**

§§ *Tongue short and weak.*

Primaries narrow, pointed, sphingiform.....**Ellema.**
Primaries wider, rounded, bombyciform.....**Exedrium.**

AMPHONYX Poey.

Cent. Lep. Cuba, Dec. i, 1832.

Large, robust, yet graceful species. Head large, broad, distinct, prominent; eyes large, hemispherical, fringed with short bristly lashes; tongue stout, slightly exceeding the tip of the abdomen in

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length; palpi reaching the middle of front, the terminal joint corneous, curved and produced into a little curved, pointed horn, projecting nakedly beyond the frontal vestiture; antennæ fusiform, prominently hooked at tip, the point gradual and aciculate, terminating in a bunch of fine hair. Thorax ovate, stout, the vestiture smooth, somewhat elevated at base, well advanced before base of primaries. Abdomen elongate, rather slender, cylindric and somewhat obtusely terminated; segments spinulose along posterior margin. The legs are long and stout, lengthening posteriorly; median and hind tibiæ with one and two pairs of spurs respectively, else unarmed. Venation as usual; primaries elongate, narrow, apex acute, outer margin oblique, slightly convex at middle, somewhat excavated above anal angle; inner margin scarcely sinuate. Secondaries small, narrow, somewhat produced at anal angle.

This genus is readily known by the peculiar structure of the palpi. The secondaries also have a semi-vitreous discal space, the base more or less yellow, giving the species a characteristic appearance.

The genus is a tropical one, containing few species, and but one—*antæus*—is found in our fauna, extending southward into S. America.

The genitalia of our species have not been examined.

P. antæus Dru., Ex. ii, 43, pl. 25, fig. 2, *Sphinx;* Westw., ed. ii, 47, pl. 25, fig. 2, *Sphinx;* Poey, Cent. Lep. Cub. Dec. i, *Amphonyx:* Wlk., C. B. M. Lep. Het. viii, 200, *Macrosila;* Clem., Pr. Ac. N. Sci. Phil. iv, 1859, 162, *Macrosila;* Morr., Syn. Lep. 1862, 186, *Macrosila;* H. S. Corr. Blatt. 1865, 59, *Macrosila anthæus:* Wallengren, Ofvers. Kongl. Vetensk. Ac. Handl. 1858, 138, *Ancistrognathus;* Grt., Pr. Ent. Soc. Phil. v. 66. *Amphonyx;* G. & R., Pr. E. S. Phil. v. 162, *Amphonyx;* Butl., Tr. Zool. Soc. Lond. ix, 599, *Amphonyx;* Gundlach, Cont. Ent. Cuba 206, *Amphonyx;* Edw.,* Ent. Amer. 3, p. 164.

jatrophæ Fabr., Syst. Ent. 538, *Sphinx;* Sp. Ins. ii, 143, *Sphinx;* Mant., Ins. ii, 94, *Sphinx;* Ent. Syst. iii, 1, 362, *Sphinx;* Gmel., ed. Linn. S. N. 2376, *Sphinx;* Westw., ed. Dru. ii, 47, pr. syn.; Hüb., Verz. 140, *Cocytius;* Wlk., C. B. M. Lep. Het. viii, 201, pr. syn.; Burm., Sph. Braz. 1856, p. 9, *Sphinx;* Clem., Journ. Ac. N. Sci. Phil. iv, 162; Bd., Sp. Gen. Het. i, 64, *Amphonyx;* Butl., Tr. Zool. Soc. Lond. ix, 599, pr. syn.

hydaspes Cram., Ins. ii, 30, pl. 118, fig. A, *Sphinx;* Fabr., Sp. Ins. ii, 143, pr. syn.

medor Cram., Ins. Ex. iv. 215, pl. 394, fig. A, *Sphinx;* Fabr., Ent. Syst. iii, 362, pr. syn.

Palpi blackish brown, beneath yellowish white. Head, thorax and abdomen blackish brown, irrorate with gray. Tegulæ with a black line at sides, inferiorly edged with white. Abdomen with a series of dorsal dusky spots of variable distinctness; a series of three yellow lateral spots enclosed by a broad blackish

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ring, and a series of decreasing blackish spots from the third yellow spot to the tip of abdomen. Primaries blackish brown, irrorate with gray scales; a grayish patch at base; basal space crossed by two indefinite and interrupted, black, transverse lines, often not attaining the inner margin. Two more distinct, somewhat approximate and nearly parallel dark lines cross the wing at basal third, strongly angulated above the median vein; discal dot pale, ringed with blackish at upper edge of cell, a more elongate spot similarly edged at lower angle. At outer third the wing is crossed by two parallel black lines obliquely sinuate, and dentate on the veins; below the middle a third parallel line becomes visible, distinct to the inner margin, but not traceable to the costa in any specimen I have seen; between veins 2 and 3, and 3 and 4, these lines are crossed by a blackish, short, longitudinal dash; nearer to the outer margin is a very wavy black line, inwardly edged with paler gray or whitish, and parallel to the inner lines, rather less oblique than the outer margin; an interrupted, very wavy terminal line; a subapical black dash connecting the terminal and subterminal lines. Fringes cut with white. Secondaries brownish black, disc semi-transparent, the veins black, base yellow. Beneath, body whitish; primaries dark brown with yellowish irrorations, most distinct on costa, a yellow patch below median cell. Secondaries with maculation of upper side reproduced. Expands 4.50—6 inches; 113—150 mm.

Hab.—Florida and southward.

There is no danger of mistaking this for anything else. It is one of our giants, and really a sub-tropical form. Madame Merian has figured the species in the "Insects of Surinam" as well as the larva and pupa. The larva is clear green, with seven oblique black bands; the caudal horn is arcuate and rough; the chrysalis is of a maroon brown with the tongue-case detached. There is a closely allied, but smaller species in Cuba, differing from the present by a decided mossy green powdering. It is Poey's *A. Duponcheli.*

DILOPHONOTA Burm.

Syst. Uebers. Sph. Bras. Verh. Nat. Geo. Halle, 1856, 69.

Body long and slender, wings narrow, comparatively short, habitus graceful. Head large, free and prominent, broad, sub-conic, the vertex pilose; eyes large and salient; tongue about as long as the body; palpi reaching the middle of front, pilose, the terminal joint sometimes exposed, varying in this, however, in the same species. Antennæ with a short, abrupt hook, setose at tip; ciliate in the ♂, simple in the ♀. Thorax elongate, well produced before the base of primaries, with a variably prominent, median, divided crest anteriorly. Abdomen elongate, slender, cylindro-conic. Legs unarmed, except the ordinary spurs of middle and hind tibiæ; increasing in

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length posteriorly. Primaries narrow, moderately long, apex pointed, outer margin oblique, somewhat scalloped between the nervules; secondaries small, the apex acute, anal angle marked, but not prominent. The venation presents nothing out of the ordinary type.

The genitalia of the ♂ are distinctive. The supra-anal plate divides rather close to the base, forming two long, somewhat divaricate prongs, which really consist of two portions; the upper is semi-chitinous, somewhat flattened and densely set with somewhat divergent bristles; the lower consists of more corneous, slender, cylindrical, smooth hooks, which are pointed at tip; side pieces oblong, with obliquely rounded tip; clasper various in shape—in fact no two species are entirely alike in any of the parts and each species will be described more in detail hereafter.

The genus is an easily recognizable one. The divided crest of the thorax is a peculiarity (among our forms) of this genus, and is distinctive. Add to this the elongate build, the somewhat scalloped margins of primaries, the confused maculation of primaries and the discolored, dusky margined secondaries, and they form a combination not readily mistakable.

The genus is a sub-tropical one, and our forms are all from southern Florida and Texas. One species, *ello*, sometimes ranges North as a visitor as far as northern New York and Massachusetts, but these are stray examples.

Six species have been described from our fauna, of which I have been unable to make a close study of *festa* and *melancholica* from lack of material. Of these *ello* and *obscura* are pale, ashy gray forms with the secondaries deep red, margined with blackish brown. Inter se these are distinguished—*ello*, by the greater size and banded abdomen; *obscura*, by its small size, and its unbanded abdomen.

The other species have the primaries dark, blackish brown, usually paler along the inner margin and sometimes gray marked. Of these *merianæ* and *edwardsii* have the abdomen banded; *merianæ* has the secondaries dull red, while in *edwardsii* they are bright yellow. The others, *melancholica* and *festa*, have the abdomen not banded, but with a dorsal stripe simply. *Melancholica* is larger and paler; *festa* is closely allied, but readily separated by its much smaller size and darker color.

It will be seen thus that every one of our species offers some salient feature, easily recognizable.

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In synoptic form the scheme appears thus:

Primaries pale ashen gray.
  Size larger, abdomen banded..... **ello.**
  Size smaller, abdomen not banded..... **obscura.**
Primaries deep dark brown.
  Abdomen banded.
    Secondaries at base dull red..... **merianæ.**
    Secondaries at base yellow..... **edwardsii.**
  Abdomen not banded.
    Size larger, color paler, inclined to ashen..... **melancholica.**
    Size smaller, color darker..... **festa.**

D. ello Linn., Syst. Nat. ed. x, 491, *Sphinx;* ed. xii, 2, 800, *Sphinx;* Mus. L. U. 351, *Sphinx;* Dru., Ex. i, 58, pl. 27, fig. 3, *Sphinx;* Fabr., Syst. Ent. p. 538, *Sphinx;* Sp. Ins. ii, 143, *Sphinx;* Mant. Ins. ii, 94, *Sphinx;* Ent. Syst. iii, 1, 362, *Sphinx;* Cram., Ex. iv, 22, pl. 301, fig. D, *Sphinx;* Gmel., ed. Linn. S. N. 2375, *Sphinx;* Hüb., Verz. 139, *Erinnyis;* Westw., ed. Dru. i, 54, pl. 27, fig. 3, *Sphinx;* Harr., Sill. Journ. 36, 297, *Sphinx;* Wlk., C. B. Mus. Lep. Het. viii, 224, *Anceryx;* Burm., Sph. Bras. 1856, 13, *Dilophonota;* Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 175, *Anceryx;* Morr., Syn. 1862, 200, *Anceryx;* H. S. Corr. Blatt. 1865, 175, *Anceryx;* Grt., Pr. E. S. Phil. v, 73, *Erinnyis;* G. & R., Pr. E. S. Phil. v, 167, 191, *Erinnyis;* Grt., Buff. Bull. i, 27, *Dilophonota;* Bd.,* Sp. Gen. Het. i, 120, *Anceryx;* Butl., Tr. Zool. Soc. Lond. ix, 603, *Dilophonota;* Fernald,* Sphing. 51, *Dilophonota;* Gundlach, Cont. Ent. Cuba, 222, *Dilophonota;* Holland,* Can. Ent. xviii, 103; Grt., Hawk Moths 46, *Dilophonota;* Edw., Ent. Amer. 3, 166.

Head, thorax and primaries ash gray, dorsal crest of thorax usually more or less discolored, as is also the vertex; patagiæ usually margined with fuscous brown, and in some specimens a fuscous tint invades the ground color. Abdomen with a broad dorsal gray line; on each side of this the segments are banded with black and gray. Beneath paler, whitish gray. Primaries in some specimens almost immaculate, an outer interrupted, dentate, transverse line and a row of terminal dots only traceable; more usually, however, there is a longitudinal fuscous and blackish shade from middle of base through the centre of the wing to the apex; above this there is always a fuscous tinge, and sometimes it becomes well marked; below this the fuscous suffusion is more rarely marked. The maculation is fragmentary, angulated and difficult to describe; a variably distinct basal line reaching from costa to the longitudinal line; a geminate line nearer the centre of the wing; a geminate, strongly dented outer line parallel to the outer margin, often reduced to a double series of venular dots; a row of inter-spaceal terminal dots. Discal dot black, at the extreme upper angle of the cell. Secondaries dull red, with a broad black outer margin, not reaching the anal angle, where there is a bluish gray patch. Beneath dull red basally, outwardly dusky fuscous, a dentate outer common line. Expands 3—3.50 inches; 75--88 mm.

Hab.—Florida and southward; westward to California; northward occasional to northern New York and Massachusetts.

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The most common of the American forms, and at the same time the most variable. It varies from an almost immaculate gray to a form with a distinct fuscous shade and an obvious, longitudinal, blackish line or shade. None of the transverse markings are distinct, yet there is no difficulty in recognizing the species, because we have no other at all resembling it in our fauna.

The species was first figured in all its stages by Madame Merian in her "Insects of Surinam," and until recently this was the only knowledge of the early stages.

The genitalia have the general form of the genus; the hooks are rather long, moderately close together and but little divergent at tip; the inferior plate is very similar in form. The side pieces are elongate, narrowing to a somewhat abrupt tip; clasper stout, corneous, somewhat twisted, with a rather spatulate, pointed tip.

Rev. W. J. Holland has given a very good description of the larval forms.

D. obscura Fabr., Syst. Ent. 538, *Sphinx;* Sp. Ins. ii, 142, *Sphinx;* Mant., Ins. ii, 94, *Sphinx;* Ent. Syst. iii, 1, 361, *Sphinx;* Gmel., ed. Linn. S. N. 2375, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 226, *Anceryx;* Clem., Journ. Ac. N. Sci. Phil. iv, 176, *Anceryx:* Morr., Syn. 1862, 201, *Anceryx;* Grt., Proc. Ent. Soc. Phil. v, 78, *Erinnyis;* G. & R., Pr. Ent. Soc. Phil. v, 168, *Erinnyis;* Grt., Buff. Bull. i, 27, *Dilophonota;* Bd., Sp. Gen. Lep. Het. i, 132, *Anceryx;* Butl., Tr. Zool. Soc. Lond. ix, 604, *Dilophonota;* Gundlach, Cont. Ent. Cuba, 220, *Dilophonota.*

stheno Hüb., Saml. Ex. Schmett. ii. *Erinnyis:* Wlk., C. B. M. Lep. Het. viii, 226, pr. syn.; Bd., Sp. Gen. Lep. Het. i, 132, pr. syn.

rhœbus Bd., Lep. Guat. 1870, 72, *Anceryx;* Butl., Tr. Zool. Soc. Lond. ix, 604, pr. syn.

Head and thorax dark gray; head with a distinct tuft between the antennæ; sides paler; front with two indistinct lines; thorax anteriorly dusky, or with indefinite lines, sides also with a dusky line. Abdomen dusky gray, not banded, but with two brownish dorsal lines. Primaries ashy gray, powdery, with the shadings and markings almost identically like those of *D. ello*, and they will not, therefore, be described in detail. Secondaries dull red, with an obscure brown marginal band, sometimes merely a dusky powdering; a grayish anal patch. Beneath reddish, outwardly shaded with fuscous, with an extra discal series of dots. Expands 2—2.25 inches; 50—56 mm.

Hab.—Pa. (?), Texas, Mexico, West Indies, South America.

Easily recognized by the small size, gray primaries and unbanded abdomen. Specimens of this very rarely range Northward, and a specimen in my possession was said to have been taken in Pennsylvania. I do not know the source whence I obtained it and I cannot

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vouch for the locality. It is a Southern form. The genitalia resemble those of *ello* so far as the supra-anal plate is concerned; the side piece is more curved, rounded at tip, and the clasper is more elongate, not twisted, somewhat beak like.

There seems to be the same range of variation noted in *D. ello*, but the species is much less abundant. So far as I am aware the larva has not been described.

D. merianæ Grt., Pr. E. S. Phil. v, 75, pl. 2, fig. 2, *Erinnyis;* G. & R., l. c. 168, *Erinnyis;* Bd., Sp. Gen. Het. i, 128, *Anceryx;* Grt., Buff. Bull. iii, 225, *Dilophonota;* Can. Ent. vii, 221, *Dilophonota;* Gundlach, Cont. Ent. Cuba, 219, *Dilophonota.*

omphaleæ Bd., Lep. Guat. 72, *Anceryx;* Sp. Gen. Het. i, 128, pr. syn.; Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 64, pr. syn.

Primaries deep blackish brown, all the transverse lines subobsolete. A triangular, subcosto-apical patch; a distinctly defined cinereous patch at about the middle of internal margin, beyond which the region within the internal angle is shaded with dull cinereous scales, which show as pale margins to the subobsolete, transverse, subterminal, undulating blackish lines; external margin denticulate; nervules interrupted narrowly with cinereous; at base of wing a few cinereous hairs. Secondaries dull reddish ferruginous, with a narrow, blackish, shaded border; dull cinereous at anal angle, where a black line is apparent; fringes, from anal angle along internal margin whitish. Beneath dull brownish; base of both wings whitish, especially the secondaries; disc of primaries very distinctly covered with reddish ferruginous hairy scales; costa at base and towards the centre on secondaries irrorate with cinereous scales; no median darker shade lines as in *oenotrus*, subterminal darker shade dentate, subobsolete. Head and thoracic region above, very deep brownish black; on the sides anteriorly a few cinereous scales which extend laterally on the thoracic region. Metathorax clothed with ferruginous-cinereous scales, which extend centrally on the disc; thorax bi-crested. Abdomen above black, banded with whitish hairs, which margin the segments posteriorly; dorsally, the scales are paler than laterally, forming a longitudinal shade stripe. Legs cinereous: tibiæ darker. Expands ♂ 3.40 ♀ 3.10 inches; 78—85 mm.

Hab.—Cuba, Am. Mer. et Aeq.; Texas.

Nearly allied to *œnotrus* Cram. The primaries are especially very similar. The pale costo-apical shade is longer, better defined and paler; the one on internal margin is also more determinate as to shape. The posterior wings are darker ferruginous than in *œnotrus*, and the external margin is not so deeply excavate before anal angle. The tegulæ in the latter species are largely brownish and the abdomen is the same shade, not black and not banded. The internal margin of the primaries in *merianæ* is much more undulate, and the whole insect is much more robust.

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The above is almost entirely from Mr. Grote's description. Specimens examined by me agree very well with this characterization and vary in the line of obscurity, the paler patches of primaries sometimes becoming almost obliterated. The genitalia are distinctive; the upper plate divides into two broad, flattened, curved hooks, enlarged basally, constricted in the middle and again enlarging toward the tip, where they diverge, and end in a rather obtuse tip; the lower plate forms two slender hooks, widely separated at base, outwardly curved and with a long, acute tip. The side piece and clasper are very much as in *ello*, but the latter is shorter, proportionately thicker. The species is not common in our fauna, and the early stages are undescribed.

D. edwardsii Butl., Pap. i, 105, *Anceryx;* Grt., New List, 1882, *Dilophonota;* Edw.,* Ent. Am. 3, 165.

Head, thorax and primaries deep fuscous brown; head darker on vertex, more yellowish at sides. Thorax with the centre of the crest blackish, the sides more yellowish, tegulæ lined with deeper brown, the lines often indistinct. Abdomen with a dorsal gray stripe with a narrow darker central line, margined each side with a broad black line; on each side of this line the segments are banded with pale, whitish gray and black. Primaries usually paler, often yellowish along inner margin, extending sometimes nearly to middle of outer margin; the maculation fragmentary and extremely difficult to describe. It consists of very strongly dentate transverse lines, usually only marked by black venular dots, except through the paler portion of wing; veins between these dots marked with paler scales, and there is a transverse series of pale venular dashes through the subterminal space; a row of black terminal lunules. Secondaries yellow at base, the outer third blackish brown, margin grayish. Beneath gray, powdery, with an outer dentate common line. Secondaries yellow along internal margin, and with a transverse line nearer base and not quite reaching the inner margin. Expands 3—3.50 inches; 75—88 mm.

Hab.—Florida.

Easily recognized, but not easily described. The species varies in depth of coloration, some specimens seen being almost purplish; there is always a pale shade along the course of the transverse posterior line below the middle of the wing. It is the only dark species in our fauna with yellow secondaries.

The genitalia are distinctive. The upper plate has the forks diverging to the middle; there bent, and converging somewhat to the tip, which is rather acute; the lower plate has the hooks shorter, much more slender, converging toward the middle, there curved and diverging to the tip. The side pieces are long, rather narrow, forming a somewhat acutely rounded tip; clasper very small, flattened, with a straight tip, before which it is notched on the upper side.

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The early stages of this species have been recently described by Mr. Edwards in "Ent. Amer." vol. iii.

D. melancholica Grt., Pr. E. S. Phil. v. 77, pl. 2, fig. 4, *Erinnyis;* G. & R., l. c. 168, *Erinnyis;* Bd., Sp. Gen. Het. i, 130, *Anceryx;* Butl., Tr. Zool. Soc. Lond. ix, 603 = ♂ *œnotrus;* Gundlach, Cont. Ent. Cuba, 220 = *obscura;* Grt., New List, *Dilophonota.*

"Anterior wings dark cinereous in the female, much shaded with blackish brown in the male, traversed by many confused, inconspicuous lines. No paler patches at apex, and on internal margin, are perceptible, while the transverse lines are more distinct terminally, and especially before internal angle, where they are margined with pale cinereous, showing the ordinary ornamentation of the genus in this respect; external margin denticulate. Posterior wings reddish ferruginous, with rather narrow blackish borders, the nervules within touched with blackish dots much as in the preceding species [*merianæ*]; external margin more excavate before anal angle than in *E. merianæ*, much as in *E. œnotrus*, which *E. melancholica* more nearly approaches. Under surface brownish, with ferruginous scales on the disc of the anterior pair; posterior wings whitish at base, below central region, along internal margin, reddish over the discal region. The under surface very generally resembles that of the preceding species (supra), while the transverse, median and subterminal dark shade bands, crossing both pair of wings, are most distinct in *E. œnotrus*, in which the median, on anterior pair, is more appreciably sinuate. In *E. melancholica* the inner (median) bands are less distinct, becoming macular, especially in the female. In *E. merianæ* the inner bands are obsolete and generally imperceptible. Thorax bi-crested; head and thoracic region above brownish black in the male, in the female cinereous black, paler laterally in both sexes. The segments are fringed with mixed paler and darker hairs, and two dorsal longitudinal shade lines are very distinct. Underneath the abdomen is paler than in either *E. merianæ* or *E. œnotrus*. Expands ♂ 3, ♀ 3.10 inches; 75—78 mm."

Hab.—Texas, Florida (?), Cuba, Central and South America.

"This species is very confusedly marked and difficult to describe, except by comparison with its allies, *E. merianæ* and *E. œnotrus*. With the latter it has a similarity of abdominal coloration and ornamentation, while the generally paler primaries, the absence of the characteristic paler patches and differing ornamentation of the tegulæ will separate it from either of its above mentioned allies."

Mr. Grote had both sexes before him, or what he supposed were such. Later he describes what he here calls the ♀ as *Erinnyis cinerosa*. Mr. Butler refers them in that way, *i. e.* ♂ and ♀ to *D. œnotrus*. Dr. Gundlach, on the contrary, does not seem to agree in this synonymy, and makes *melancholica* a synonym of *D. obscura*, which is manifestly an error, unless Dr. Gundlach has in mind an entirely different insect as *obscura* from that so named by American entomologists.

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My material in this species was too scant to permit me to decide on the synonymy, and, as the insect scarcely belongs to our fauna, I have simply repeated Mr. Grote's description. For the same reason I am unable to give a description of the ♂ genitalia. I have seen no United States specimens. It is readily recognized by the not banded abdomen and large size.

The early stages appear unknown.

D. festa Hy. Edw., Pap. ii. 11, *Dilophonota*.

"Head smoky black on crown, mingled with grayish, with two white lines between the antennæ. Thorax blackish, mingled with gray; a double median line, and the tegulæ and space at base of the wings gray. Abdomen dull iron gray, with very faint blackish dorsal double line, enclosing a paler space Sides and undersides of both abdomen and thorax white, thickly interspersed with brown scales. Antennæ with the shaft white, the pectinations fawn color and the tip pitchy brown. Palpi and the whole of the legs white, with brown scales. Primaries black, with a few gray scales intermixed, except on the apex and along the internal margin, where the gray predominates. The wings are deeply notched at the termination of the nervules, which are white and jet black, on a gray ground. Secondaries dull red, with a whitish streak at base. The costal margins also whitish. Apex shaded with dull black, continued around the margin to near the anal angle, where the usual mark of the genus occurs. In this species it is a waved, broad line of black and gray alternately, the gray line being double, the upper strongly toothed. The nervures are black as they approach the margin. Fringes gray, except on the abdominal margin, where they are clear white. Underside of wings dull brick red at their base, brownish toward the extremities, the margin speckled with black and white, and the whole surface mottled with brown scales. Expands 2.65 inches; 66 mm."

Hab.—N. W. Texas.

This description is a copy of Mr. Edwards' original characterization of the species, and like that gentleman's descriptions usually, very accurate.

Mr. Edwards says it is allied to *D. melancholica*, but the wings and abdomen are blacker, the marginal band of secondaries less distinct and the anal spot more gray in color. The larva has not been described.

Since the above was written I have discovered two ♂ specimens among Prof. Riley's material in the Museum collection. The one from Texas, collected by Belfrage, agrees very well with Mr. Edwards' description in all details. The other, without locality, was labelled *obscura*, and Mr. Grote is given as authority for the name. This specimen is much paler than the other, more ashen gray, the veins black marked and a central longitudinal dark shade. The specimen bears a very strong resemblance to an extremely distinct

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obscura, and I am not at all sure that it will not prove to be such eventually. The size is similar, the secondaries have the same ground color, and the maculation of primaries in the better marked forms of *obscura* is very similar, though much less distinct. The species is nearer to *obscura*, at any rate than to *melancholica*, though I admit that with Mr. Edwards' type form alone before me I should have agreed with him in the separation.

CAUTETHIA Grt.

Ann. Lyc. Nat. Hist. N. Y. viii, 202.

Small, rather robust, but not heavy. Head large, distinct, not prominent. A slightly pointed tuft between the antennæ, which are fusiform, rather more than half the length of primaries, with a long, abrupt hook at tip; ciliate in the ♂, simple in the ♀. Tongue nearly as long as the body, stout. Palpi reaching the middle of front, the joints distinct, not so heavily clothed. Eyes widely separated, of good size, not lashed. Thorax convex, vestiture scaly, somewhat elevated posteriorly. Abdomen moderate in length, cylindro-conic. Legs becoming longer and stouter posteriorly; tibiæ not spinose; median with one pair of spurs, posterior with two pairs. Primaries somewhat elongate trigonate, apex rounded, outer margin oblique; secondaries trigonate; venation of the normal type.

The genitalia of the ♂ are somewhat peculiar; the supra-anal plate is transversely flattened, the hook but little curved, somewhat bulbous just before tip; the inferior process is slender, cylindrical, curved, with a bulbous tip. The side piece is elongate, narrowing to the tip; no distinct clasper.

Messrs. Grote and Butler placed this genus with *Anceryx* and *Dilophonota;* later, Mr. Grote places it in the "*Caudiberbes*" in deference to the opinion of Mr. Hy. Edwards, who says, as to its location near *Anceryx*, "This appears to me to be an error, its coloration, shape of wing, extremely long tongue and tufted abdomen bearing a closer resemblance to the *Macroglossinæ*." Boisduval also places it with the latter group. In coloration it is quite as close to *Dilophonota* as to any *Macroglossid*, while the long tongue is a typically *Sphingid* feature. The antennal structure alone, however, would remove it to the locality Messrs. Grote and Butler assigned to the genus, though it does undoubtedly present resemblances to *Macroglossa*. The abdominal tufting is slight and of no consequence.

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The genus is easily recognized by its small size and lack of all peculiar characters.

One species occurs in our fauna:

C. grotei Hy. Edw., Pap. ii, 10, *Cautethia;* Gundlach, Cont. Ent. Cuba, 179, *Cautethia;* Edw.,* Entom. Amer. iii, 164.

noctuiformis ‡ H. S., Ex. Schmett. ii, fig. 552, *Œnosandra;* Cuba, p. 21, *Œnosandra;* Grt., Ann. Lyc. N. H. viii, 202, *Cautethia;* Bd., Sp. Gen. Het. i, 319, *Œnosandra;* W. H. Edw., N. Am. Ent. i, 103; Butl., Pap. i, 105, an sp. dist. *noctuiformis* Wlk.

"General color of primaries brown black, with a grayish tint. Basal space blackish, enclosed by a double, indistinct, black line. Discal mark velvety black. Posterior double line also black, the inner one bent forward very suddenly towards the costa from the subcostal nervure, the outer one nearly straight for its costal half and sharply dentate on the nervures. The submarginal line has a grayish white shade behind it continuing to the edge of the wing, and there is also a blotch of the same color near the centre of the internal margin. Fringes alternately black and gray. Secondaries rich, bright orange for the basal two-thirds. Marginal band brown [blackish], moderate in width. Underside brownish, flecked with white scales, the base of the secondaries dull orange along the abdominal margin. Thorax and abdomen grayish, with black scales; the fifth and seventh segments banded with darker shades as in *Macroglossa.* Antennæ dusky black." Expanse 1.30 inches; 33 mm.

Hab.—Florida.

The above description is that given by Mr. Edwards, "Papilio" ii, 10, and Mr. Edwards adds that he has several examples all constant to the description. A series in the Museum collection shows more variation. Some specimens are uniformly gray, the markings as described by Mr. Edwards sharply defined; others have a dark patch in the space between the outer transverse line and submarginal pale line near the inner margin; others again have the entire space between these lines blackish as well as the basal space. The ground color differs considerably in tint.

Prior to 1881 this species had been considered the *Œnosandra noctuiformis* of Walker. In "Papilio" i, 105, Mr. Butler says it "does not agree with Walker's type from San Domingo, the primaries are considerably darker, and the dark brown border of the secondaries of only half the width; it must be distinct."

Mr. Edwards in describing the species quotes a letter from Mr. Grote, who compared specimens of one form with Walker's type. He says: "I have carefully examined the type of *Cautethia noctuiformis* Walker. The specimen is unset, and smaller than ours from Florida; the fore wings very similar, but the hind wings have the

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yellow only a patch at base and resting on the internal margin. The wider fuscous border extends also on costal region, and the yellow is paler."

Mr. Neumoegen contends that this is but a local form of the San Domingo species, and he may be right. I have not material enough to settle the question.

The larva has been but recently described by Mr. Edwards in "Entomologica Americana" iii, 1888, p. 164.

PROTOPARCE Burm.

Sphing. Braz. 1866, p. 7, 63.

Head large, prominent, untufted; eyes large, prominent; not, or very feebly lashed; palpi long, ascending, appressed to front, the basal joint unusually long, second so clothed as to appear clavate, third joint minute; antennæ fusiform with a short, abrupt, recurved, setose tip; tongue as long, or longer than the body. Thorax stout, well advanced before base of primaries, with short, stout, erect, post-thoracic tufts. Abdomen cylindro-conic, pointed at tip, untufted, the segments posteriorly spinulose. Legs moderate in length, stout, somewhat lengthening posteriorly; median tibiæ with one pair, posterior with two pairs of long, unequal spurs. The fore tibiæ and tarsi are variably armed; in *celeus* there is a series of dorsal spinules on tibia, two long spines outwardly near tip, three distinct, long, stout outer spines to first tarsal joint and a long spine at tip of second and third tarsal joints; in *carolina* the armature is similar, but very much reduced; the spines of fore tibiæ are minute and hardly prominent; those of the tarsi are more slender; in *rustica* the armature is still more reduced, that of fore tibiæ consists only of minute spinules at tip; first tarsal joint with a series of small lateral spines and a larger one at tip; the second and third joint with simply a longer spine at tip; in *cingulata* the fore tibiæ are entirely unarmed, and the tarsal joints have the faintest reproduction of the armature of *carolina*.

The primaries are usually eleven veined; rarely a specimen will have twelve veins; the outer margin roundedly oblique; in *celeus* (which has the primaries somewhat broader also than in the other species), somewhat more oblique in *carolina*, with a trace of an indenture on vein two, while in *rustica* and *cingulata* the excavation on vein 2 is distinct, and the angle below prominent. Secondaries with the margin somewhat produced on vein 1b; in *celeus* less so than in the others. The venation is of the typical form.

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As in the other characters the genital structure is variable. The supra-anal plate and hooks have, essentially, a similar form, the hook being rather long and curved, almost meeting the inferior process, which is stouter, but much shorter; the side pieces and claspers vary, so that it will be necessary to describe them in detail with each species.

The characters that hold together these species are the prominent head, large eyes and heavy build. These give them a distinctive appearance, the eyes especially, being much larger and more prominent than in the succeeding genera.

Celeus is a heavier, more robust form than either of the others, with wider wings and more even outer margin and heavier tibial armature. The secondaries have the median lines very distinct and strongly dentate.

Carolina is intermediate between this and the other species as well in wing shape as in the armature of fore legs. It is a decidedly slighter insect. The secondaries have the two median lines much less distinct, obscured by a dusky shade and not distinctly dentate on the veins.

Rustica differs at once by the deep umber brown color, with the prominent white maculation. It is a stouter insect than *carolina*, but not so heavy as *celeus*. All these have the sides of abdomen maculate with yellow.

Cingulata differs from all the others in the rose red maculation of the abdomen and secondaries. In habitus it is much like *rustica*.

It will be seen that the genus is not the most compact, yet the species form a rather distinctive group, which has been almost universally recognized by authors, though but the least satisfactory characters were relied upon or discovered; most of them were content to recognize the genus without troubling themselves to define it.

I have used Burmeister's term *Protoparce*, following Butler in this respect. Hübner's term is not one expressing a distinct idea, and the three American species now referred as congeneric were placed in three distinct *coiti* by him.

P. celeus Hüb., Samml. ii, pl. 377, *Phlegethontius;* Edw.,* Pr. Cal. Ac. Sci. vi. 92, *Macrosila;* Butl., Trans. Zool. Soc. Lond. ix. 607, *Protoparce;* Behr.,* Pap. ii, 3; Grt., Pap. ii, 99; Fernald,* Sphing. 33, *Phlegethontius;* Grt., Hawk Moths 40, *Phlegethontius.*

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quinquemaculata Haw. in Steph. Ill. Br. Ent. Haust. i, 119, *Sphinx;* Wood, Ind. Ent. 246, pl. 53, fig. 23, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 217, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 166, *Macrosila;* Morris,* Syn. 1862, 190, *Macrosila:* Harr.,* Inj. Ins. Flint ed. 320, figs. 142, 143 (all stages); Fitch,* 9th N. Y. Rep. pl. 4, fig. 1, *Sphinx;* Lint., Pr. Ent. Soc. Ph. iii, 648, *Sphinx;* G. & R., Pr. E. S. Phil. v. 163, 187, *Macrosila;* Beth.,* Can. Ent. i, 17, *Macrosila;* Gentry,* Can. Ent. vi. 88; Pack.,* Common Ins. 197. fig. 239, *Sphinx;* Bd.,* Sp. Gen. Lep. Het. i. 76, *Sphinx;* Riley,* 8th Mo. Rep. 95, fig. 38 (all stages); Am.* Ent. i, 23, fig. 10 (all stages); Scud.,* Psyche ii, 75; Butl., Tr. Zool. Soc. Lond. ix, 707, pr. syn.; Beth., Can. Ent. xii, 101.

carolina ‡ Don., Brit. Ins. i, 11, pl. 361, *Sphinx;* Wlk., C. B. M. Lep. Het. viii. 217, pr. syn.

General color above and below ashy gray. Dorsum of thorax brownish, collar tipped with brownish; a fine, black, transverse line at base; a broader, arcuate one at middle, and another less distinct midway between the last line and the tip. Two or three inconspicuous, transverse lines anteriorly on dorsum of thorax. Patagiæ edged with black, and an angulated black line through the middle, not reaching the tip. The metathoracic tufts are blue, followed by a black patch, which extends across the base of thorax and is followed by a black line. Abdomen with a fine black dorsal line, a row of five orange colored spots surrounded with black along the side, and the segments above and below these spots are edged with white. Beneath, a row of four or five black spots along the middle of abdomen. Primaries shaded with brown beyond the middle and toward apex, a series of three indistinct, parallel, blackish lines from costa near base, running outwardly to near the small, round, discal ringlet, thence inwardly bent and much more distinct to the inner margin near base. A series of three nearly parallel, much angulated brown lines from outer fourth of costa, outwardly curved to middle, then obliquely inward to middle of inner margin. A less angulated line, from costa nearer to apex brown for one-fourth of its course, then black and nearly parallel with outer margin to inner margin within the anal angle. A subterminal brown line, inwardly edged with white, runs near to and parallel with outer margin, but does not reach either costa or inner margin. An oblique, sinuate, black, apical dash; another longitudinal dash upwardly curved at its outer end between veins six and seven; between veins five and six another, but less distinct black line extending from the end of cell to the outer, black, transverse line. Fringes brown, narrowly cut with sordid white. Secondaries whitish gray, with a broad outer border of ashy gray, on the inside of which is a blackish band, broader toward costa and tapering to a mere line at anal angle. A brown spot at base of wing; a doubly curved, basal, blackish, transverse line; middle of wings crossed by two blackish, parallel, dentate lines, making an outward and downward curve to the anal angle. Fringes gray, cut with white. Beneath, primaries with the apical and intra-venular black dash reproduced, and an obscure, dentate brown line across outer fourth. Secondaries with outer margin shaded, and two strongly dentate, median transverse lines, rather widely separated at costa, but converging toward inner margin. Expanse 3.75—5 in.; 94—125 mm.

Hab.—United States; Canada.

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A widely distributed species, and not uncommon anywhere. It varies very little, except in depth of ground color and comparative distinctness of maculation. The genitalia of the ♂ have the supra-anal plate narrow, the hook long, stout, somewhat triangular, curved and acute at tip, meeting the inferior process, which is shorter, stouter and straight, having an internal acute hook with an outer, less chitinous, broad, upturned fold covering it and forming the apparent tip. Side piece oblong, parallel, with a rather irregularly rounded tip; the clasper is broad, excavated, with the inferior angle produced into a short, acute point.

The larva has been long known, and is figured and described in most popular works, yet I cannot find any complete life history, nor does the egg seem to have been described. The larva is extremely variable in color.

P. carolina Linn., Mus. L. U. 346, *Sphinx:* Syst. Nat. ii, 798, *Sphinx;* Dru., Ill. i, 52, pl. 25, fig. 1, *Sphinx;* Brown, Jamaica, 438, pl. 43, fig. 17; Fabr.,* Syst. Ent. 539, *Sphinx;* Sp. Ins. ii, 144, *Sphinx;* Mant., Ins. ii, 94, *Sphinx;* Ent. Syst. iii, 1, 363, *Sphinx;* A. & S., Ins. Ga. i, 65, pl. 33, *Sphinx;* Gmel.,* ed. Linn. S. N. 2377, *Sphinx;* Hüb., Samml. Ex. i, pl. 170, *Manduca obscura;* Verz. 140, *Phlegethontius;* Steph., Ill. Br. Ent. Haust. i, 118, *Sphinx;* Curtis, Brit. Ent. v. pl. 195, *Sphinx;* Westw.,* ed. Dru. i, 47, pl. 25, fig. 1, *Sphinx;* Wood, Ind. Ent. p. 246, pl. 53, fig. 22, *Sphinx;* Harr.,* Sill. Journ. 36, 294, *Sphinx:* Wlk.,* C. B. M. Lep. Het. viii, 216, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 165, *Macrosila;* Morris,* Syn. 1862, 189, *Macrosila;* Harr.,* Inj. Ins. Flint ed. 322, figs. 145-147, *Sphinx;* H. Sch., Corr. Bl. 1865, p. 59, *Sphinx;* Grt., Pr. Ent. Soc. Phil. v. 69, *Sphinx;* G. & R., Pr. Ent. Soc. Phil. v. 163, *Macrosila;* Bd.,* Sp. Gen. Lep. Het. i, 70, *Sphinx;* Edw.,* Pr. Cal. Ac. Sci. vi. 92, *Macrosila;* Scud.,* Psyche, ii, 73; Butl., Tr. Zool. Soc. Lond. ix. 606, *Protoparce;* Grt., Buff. Bull. iii, 224, *Phlegethontius;* Leidy,* Pr. Ac. N. Sci. Phil. 1882, 237; Behr.,* Pap. ii, 3, *Macrosila;* Gundlanch, Cont. Ent. Cuba, 210, *Macrosila;* Fernald,* Sphing. 31, *Phlegethontius;* Grote, Hawk Moths 40, *Phlegethontius.*

Head, thorax and primaries above, dark brownish gray or fuscous. Palpi a little lighter beneath and in front. Collar and base of patagiæ laterally also paler, the former with an indistinct, darker, transverse line. Thorax anteriorly black marked, and there are some irregular, black spots edged with white posteriorly; the metathoracic tufts are black, rarely with a trace of blue scales. Abdomen with a gray dorsal band, in which is a narrow, more or less complete central black line, the edges of the segments dotted with white; laterally is a series of five large orange spots, decreasing in size posteriorly and surrounded with black; below these spots is a series of white dots. Beneath a series of median dusky spots variable in number and sometimes entirely absent. Primaries with a small white spot at base and a small, irregular, whitish discal spot edged with brown. Four angulated, dusky lines cross the wing inside the discal spot, about equidistant at costa, and so arranged as to give the basal field a long, acute,

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outward angle on the cell. Three similar lines cross the wing beyond the cell, giving off acute angles on the veins and often fusing together below the discal spot, and forming a more or less evident brown patch. The space following these lines is usually darker, more brownish. Another single, angulate and dentate line crosses the wing rather close to outer margin, becoming more distinct towards the inner margin. Still nearer to the outer margin and parallel with it is a white, dentate line, which does not reach the costa. A dark brown or blackish streak extends obliquely inward from the apex, and is edged above with whitish gray. Fringes cut with gray between the veins. Secondaries gray, with a small, smoky brown spot at base, a line extending nearly across the wing outside of this spot, two more slightly dentate across the middle, the space between them dusky, and another margining the outer gray band, which is broad at the costa and tapers to a point at the anal angle. Beneath, the primaries are of a uniform dark fuscous gray, crossed by two or three parallel lines beyond the cell, and dentate on the veins, while the wing beyond is somewhat clouded. Secondaries of a lighter shade than primaries, crossed by three median lines strongly angulated on the veins. A shade band crosses the wing beyond this, and the anal portion is whitish. Expands 3—5 inches; 75—125 mm.

Hab.—United States; Canada; West Indies.

This species also varies little, except in size, and comparative distinctness in markings. It is a much more sordid form than the preceding, and this as well as the other previously noted differences will serve to distinguish it.

The supra-anal plate and hook are very similar to that in the preceding species; the side piece is broader, tapering rapidly from either side to a blunt tip. The clasper is unique, and resembles nothing more in shape than a mitten with the thumb drawn out to a point and somewhat curved, while the outer edge of the hand is irregularly serrate. The structure is unique and very different from that of *celeus*.

This species, as well as *celeus*, figured for a time among the British species. Stephens obtained some specimens of the home of which he felt certain, and for a long time the species stuck as a European.

The larva of this species was known as long since as Fabricius, who gives a short description of it. Since then it has been figured and described times without number, yet, as with *celeus*, the egg is still undescribed so far as I can find.

P. rustica Fabr., Syst. Ent. 540, *Sphinx;* Sp. Ins. ii, 145, *Sphinx;* Mant., Ins. ii, 95, *Sphinx;* Ent. Syst. iii, 1, 366, *Sphinx;* Sulz., Ab. Gesch. Ins. pl. 20, fig. 2, *Sphinx;* Cram.,* Ex. iv, 21. pl. 301, fig. A, *Sphinx;* Gmel., ed. Linn. S. N. p. 2385, *Sphinx;* A. & S.,* Ins. Ga. i, 67, *Sphinx;* Hüb., Verz. 140, *Cocytius;* Burm.,* Sph. Braz. 1856, Verz. Naturf. Ges. Halle, 63, *Protoparce;* Wlk., C. B. M. Lep. Het. viii, 199, *Macrosila;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 163, *Macrosila;* Morr.,* Syn. 1862, 187, *Macrosila;* H. Sch. Corr. Blatt. 1865,

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59, *Sphinx;* Grt., Pr. Ent. Soc. Phil. v 68, *Sphinx;* G. & R., Pr. E. S. Phil. v. 162, *Macrosila;* Bd., Sp. Gen. Lep. Het. i, 82, *Sphinx;* Grt., Buff. Bull. iii, 224, *Phlegethontius;* Butl., Trans Zool. Soc. Lond. ix. 606, *Protoparce;* Gundlach, Cont. Ent. Cuba, 208, *Macrosila;* Grote, Hawk Moths 40, *Phlegethontius;* Edw.,* Ent. Amer. iii, p. 164.

chionanthi A. & S.,* Ins. Ga. i, 67, pl. 34, *Sphinx;* Hüb., Verz. 139, *Acherontia;* Duncan,* Nat. Lib. 37, p. 100, pl. 5, fig. 2, and pl. 6, fig. 2, *Sphinx;* Grt., and Rob., Pr. E. S. Phil. v. 63, pr. syn.

Head, thorax and primaries above, blackish or ferruginous brown, marked with black and white. Palpi white, except at tip. Head with a transverse, interantennal white line, and a white spot behind base of antennæ. Thorax with a gray dorsal line, with a median blackish tufting which is white margined; metathoracic tuftings black, anteriorly margined with white or gray. Tegulæ at base of wings white. Abdomen paler brown than thorax, with a more or less evident black dorsal line and a series of white spots on the hind margins of segments subdorsally; laterally a series of three large, round, orange spots margined with black; the other segments rather irregularly and variably marked with black and white. Primaries white marked at base; within the small, triangular, white discal dot, is a series of four zigzag brown lines, the intervals between first and second, and second and third, white; the lines are but slightly sinuate and scarcely bend outwardly over the cell; the fourth line is somewhat more remote from the other, and is darker, more nearly black. Below vein two and beyond these lines the inner margin is heavily powdered with white. Beyond the cell is an irregularly dentate, black, transverse line outwardly bent from costa, then incurved to within the middle of the hind margin. Beyond this is a series of three black, dentate, transverse lines, the intervals white, and between the second and third the centre of the interval is filled with a yellowish brown shade; of these lines the first and second are rather close together and parallel; the third is remote from the others, and is very irregularly lunulate and angulated. A subterminal, dentate, white line not reaching the costa, and outwardly and irregularly black margined. Anal angle white, the subterminal space opposite the cell strongly white marked to margin. A sinuate, oblique, apical line, superiorly white marked. Fringes cut with white. Secondaries blackish brown, white marked at base; an obscure whitish band near base; two obscure, black, median lines, followed by a variably distinct white shade. Marginal space more or less strongly white and yellow marked. Beneath, primaries deep ash gray, powdery, with the extra discal series of transverse lines of upper side faintly reproduced. Secondaries paler gray, with a broad, deep, ashy brown, outer margin, disc crossed by three parallel, dentate, transverse lines. Expands 3.50—5 inches; 87—125 mm.

Hab.—New York and southward into South America; Texas.

This species is very characteristically marked and not easy to mistake. The chief variation is in the distinctness of maculation, in the amount of white powdering, and in the depth of color—a variable quantity bye-the-by—since fresh specimens are usually very deep, blackish brown; age renders them a rather light rusty red.

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In the ♂ genitalia the supra-anal plate shows no important differences from that of *celeus*, save that the hook is less curved; the side pieces are rather narrow, elongate, the tip narrowing and obtusely rounded. The clasper is a long, tapering, sinuate prong, with the edges serrate; very different from anything else in the genus.

The larva has been figured by Smith and Abbot, and subsequent authors have copied from them, so far as I can find. Burmeister gives a brief, original description from Brazilian specimens.

P. cingulata Fabr., Syst. Ent. 545, *Sphinx;* Sp. Ins. ii, 151, *Sphinx;* Mant., Ins. ii, 97, *Sphinx;* Ent. Syst. iii, 1, p. 375, *Sphinx;* Gmel., ed. Linn. S. N. v. 2378, *Sphinx;* Hüb., Samml. ii, 378, *Agrius;* Verz. 140, *Agrius;* Westw., ed. Dru. i, 49, pl. 25, fig. 4, *Sphinx;* Harr.,* Sill. Journ. 36, 293, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 215, *Sphinx;* Burm., Sph. Braz. 1856, 12, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 164, *Macrosila;* Morris,* Syn. 1862, 188, *Macrosila;* Lint.,* Pr. Ent. Soc. Phil. iii, 650, *Macrosila;* Bd.,* Sp. Gen. Lep. Het. i, 95, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 608, *Protoparce;* Grt., Buff. Bull. iii, 224, *Phlegethontius;* Gundlach, Cont. Ent. Cuba, 211, *Macrosila;* Fernald,* Sphing. 35, *Phlegethontius;* Grt., Hawk Moths 40, *Phlegethontius.*

affinis Goetze, Beytr. iii, 2, p. 215, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 608, pr. syn.

convolvuli ‡ Dru. Ex. i. p. 54, pl. 25, fig. 4, *Sphinx;* Cram., Ex. iii, 55, pl. 225, fig. D, *Sphinx:* S. and A., Ins. Ga. i, p. 53, pl. 32, *Sphinx;* Westw., ed. Dru. i, 49, pr. syn.

pungens Eschscholz in Kotzebue's Reise, p. 218, pl. xi, fig. 28; Butl., Tr. Zool. Soc. Lond., ix. 608, pr. syn.

druræi Don., Br. Ins. xiv. pl. 469, *Sphinx;* Wood, Ind. Ent. 246, pl. 53, fig. 4, *Sphinx;* Steph., Ill. Br. Ent. Haust. i, 120, pr. syn.

Var. **decolorata** Hy. Edw., Pap. ii. 11, *Sphinx.*

The head and thorax above are grayish brown; palpi somewhat paler above, white beneath. Collar with two transverse black lines; patagiæ edged with black and with a black line through the middle, below which they are gray; metathoracic tufts black, edged in front with blue and behind with yellow. Abdomen with dorsum broadly brownish gray, with an interrupted brown dorsal line; there are five rosy, oblong, lateral spots, decreasing in size posteriorly and separated by black bands. The sides of the thorax, abdomen and all the legs are of a lighter gray color, while the under side of the body is whitish, with a row of three or four black spots along the middle of the under side of the abdomen. Primaries dark brownish gray, with a small gray spot at the base. The discal spot is small, reniform, pale gray and encircled with black. A series of three or four angulated, blackish brown lines cross the wing basally and inside the discal spot, and a series of three similar lines crosses the wing beyond the discal spot, outwardly angulated below the cell and reaching the internal margin about one-third from anal angle; along the outer of these lines is a grayish white accompanying shade. These two sets of lines are joined by a dark brown shade with two black dashes in it below the cell, thus forming, with the upper and darker

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parts of the lines, a large, quadrate, darker area, which rests on the middle of the costa, and extends rather more than half way across the wing, containing the reniform or discal spot. A brownish shade follows these outer lines, then an outwardly curved, interrupted somewhat lunulated black line, strongest at its inception on costa. Parallel with and near to the outer margin is a row of outwardly curved lunules, inwardly marked with gray and outwardly brownish to the outer margin opposite each lunule. An irregular black line, shaded above with gray, extends obliquely inward from apex. The fringes are brown, marked with white between the veins. Secondaries rosy red, with a broad, gray, outer margin. An irregular black loop at base; a broad, sinuate, median line, and a black shade margining the gray outer space, broadest on costa. Beneath, primaries mouse gray, with three faint, dentate lines beyond the cell. Secondaries mouse gray, whitish between the median and outer bands and along inner margin; a series of three dentate, median lines, uniting at middle and then as a black band to inner margin. Expands 3.75—4.50 inches; 94—112 mm.

As variety *decolorata* Mr. Edwards describes a form from Florida in which the rose-colored shade on the base of primaries and at the sides of the abdomen is wanting. In all other respects the markings are as in the type form. He adds that the species extends from Canada to Brazil and reaches the extreme west of our continent; also that it is abundant in the Hawaian Islands.

Hab. as above.

There is little variation in this species, except as above set out. The species is not common usually. The larva of this species is quite variable, as in others in this genus, and the variations have been well described by Prof. Lintner. No history of the egg or earlier larval stages has been written to my knowledge. The ♂ genitalia are, as to the supra-anal plate, like the others of this genus; the side piece not unlike *celeus*, while the clasper is moderately long, stout, at tip divided into two curved, acutely terminated hooks, the upper much more curved and at an angle with the other. The rosy lateral spots of abdomen and on secondaries easily distinguish this species.

SPHINX Linn.

Syst. Nat. Ed. x, p. 489.

Head moderate or small; distinct, yet neither retracted nor prominent. Eyes small, round, somewhat variable in size, usually very distinctly lashed, but often the circle of hair becomes very much reduced, and the term "lashed" must be a little liberally understood. Antennæ subfusiform, somewhat variable in the form of the tip, which may be abruptly bent, or on the contrary be gradual and somewhat curved. The tongue is long, stout and corneous. Palpi

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usually reaching the front, never very prominent, sometimes quite stout and reaching to the middle of front and varying from that to small, weak processes hidden in the dense vestiture. Thorax stout, with upright, short, metathoracic tufts. Variably produced in front of the base of primaries, but never very much. Abdomen conic, untufted, the posterior edges of segments spinulose. Legs very variably armed, sometimes the fore and middle tibiæ are very densely spinulose, and there is no armature of the fore tarsi; sometimes there are a series of stout spines at outer side of the first joint of anterior tarsi; again the spinulation, while all present, may be very much reduced. Some species have the fore tibia only spinose, and here there is usually a heavy armature to the fore tarsi consisting of stout, claw-like spines; sometimes there is but a very slight armature to the fore tibia and a strong armature to the tarsi. The spurs of the middle and hind tibia also vary in length; sometimes they are weak and short, while in other species they are very long and stout, equalling nearly half the length of the tibia. There is usually no very great difference in the length of the legs. As a rule the short spurs occur in those species in which the fore and middle tibiæ are heavily spinulose, while the tarsi are unarmed, but there is no rule, and the variations run into each other by imperceptible degrees. The venation is typical. Primaries usually narrow, with acute apices and very oblique outer margin, which may be almost straight, or may be somewhat convex. Here, also, there is every variation. The secondaries vary only in width, and are all narrow, with the apex distinct. The genital organs vary considerably, and will be described with the species.

In maculation there is a considerable sameness. The ground color is usually gray, rarely somewhat fuscous, and in one case only distinctly yellow brown. The transverse lines are, as a rule, almost obsolete, and most species, in fact I think all of them, have black, longitudinal markings or dashes between the veins.

This characterization includes the species usually separated as *Hyloicus*. There is here considerable variation in color, maculation, armature and wing shape, and yet I find myself incapable of drawing any line sufficiently distinct to separate genera—unless, indeed, I chose to make at least six genera of our species.

In the arrangement of species I have adopted a sequence based partly on maculation and partly on structure, which seems to associate the species very well with very few exceptions.

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The first group contains insects at once recognizable by the discolored disc of thorax. They agree also in narrower, pointed wings, in very heavily spinose fore and middle tibia, and, with one exception, no special armature of the fore tarsi. The spurs of the middle and hind tibiæ are short.

Kalmiæ is easily distinguished from all the other species by its yellowish brown color. All the others have a shade of gray as base.

Drupiferarum has the costal region much paler than the rest of the wing, which is a dull fuscous gray, with a decided brownish tint. A variety has been named *utahensis*, and another *vancouverensis*, by Mr. Hy. Edwards. In this species, while there is no distinct armature of fore tarsi, the series of spines outwardly show some unusually long and prominent ones indicating the more distinct armature of the other groups.

Perelegans is a much more evenly colored species, with very dark gray ground, and a submarginal whitish band. The palpi are much more distinct than in either of the preceding species. The armature is like *drupiferarum*.

Gordius is, in wing shape, much like the preceding, but the palpi are smaller; there is a luteous shade over the primaries which show also a usually very distinct white discal spot, while the median band of the secondaries is somewhat fainter than usual. The armature of legs is as in *kalmiæ*.

Luscitiosa is closely allied, but is still more brown, the discal white spot is wanting on primaries, the secondaries are yellow, the median band reduced to a mere trace and often entirely wanting. The palpi also are still shorter, and the outer margin of primaries is more evenly oblique, not so convex as in *gordius*, which it resembles in armature of legs.

Albescens differs from all in this group by the heavily armed fore tarsi, there being three stout outer spines to the first joint and two to the second. The middle tibiæ are not so heavily spined and the spurs are moderate. In maculation also it differs from all the others by the oblique, submarginal black streak followed by a whitish shade. It combines the features of the present with those of the following group.

This following group is characterized by concolorous dorsum of thorax, the patagiæ black margined, wings rather wider, armature of fore tarsi usually distinct.

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Vashti is nearest to *albescens*, differing from it principally in the concolorous thorax, the patagiæ only being heavily black edged.

Libocedrus I have not examined closely enough to give details as to differences. The thoracic markings are very much as in *chersis*, except that in addition to the triangle outlining the patagiæ there is also a line through the middle of each.

Chersis has, on the thorax, a triangle, its apex towards the head. The submarginal black streak is somewhat irregular and not followed by a white shade. *Oreodaphne* Edw., was based on a small specimen.

Insolita is a small species, very much like *vashti* in style of maculation, but not near so distinct. The abdominal bands are beautifully cream colored and the secondaries black at base. Very much resembling these others in markings and in the armature of the legs is the next group, obviously differing from them in the immaculate secondaries.

Of these *pinastri* is the largest, and distinguished at once from all others by usually having a distinct, single, basal, transverse band on primaries, with a variable number of interspaceal dashes from this band. The lateral thoracic bands are straight and run through the middle of the patagiæ instead of on the margin. Mr. Strecker described and figured the species as *saniptri*, and afterward stated it was identical with *pinastri*. I have never seen a *pinastri* from the United States, and I do not believe, judging from the figure, that Mr. Strecker's species is identical with the European insect, yet I follow his reference, since I do not know his species.

Sequoiæ has the wing form of *pinastri*, but is smaller. It lacks all trace of the transverse line of primaries and has a submarginal black streak similar to that in *vashti*, *chersis*, etc. The patagiæ are black margined, and there is also a black line through the middle.

Very similar in maculation, but much smaller and paler is *dollii* Neum. This is the smallest species of the genus expanding less than two inches.

Coloradus differs, obviously, from the others in having two broad brown thoracic stripes margining the patagiæ and extending nearly to their middle. There is an oblique dusky shade band extending from the inner margin near to base through the centre of the wing to the apex, margined above by a pale gray shade.

In all these species the palpi are short, the frontal vestiture is loose and the head is not prominent. The spurs of the middle and hind tibiæ are short.

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The next group contains species in which the middle tibiæ are not spinose, the fore tibia sparsely or not spinulose, while the fore tarsi have the first and second joints outwardly armed with a rather heavy claw-like spines. The primaries are comparatively somewhat shorter and broader, with less oblique margin than in the previous groups. The head is distinct, and except in *elsa*, which is aberrant, the palpi are well developed and reach well up the front. The species seem more robust in build than the others. The maculation is of the same type as the previous groups, but is much heavier and the species have not, therefore, that uniform grayish appearance.

Elsa is an aberrant and beautiful species. The palpi are smaller than in the others of the group, and the spurs of the middle and hind tibiæ are small. It is the connecting link, structurally, between the typical *Sphinx* and the *Hyloicus* structure. In color it is white, with black powderings on primaries and with a more or less evident suffusion of pale brick red, most distinct in the ♂. The secondaries are white, with two black bands.

Canadensis resembles in color and general appearance *gordius*, but the dorsum of the thorax is not dark. The secondaries resemble those of *chersis*, and it is possible it may belong with that group. I have been unable to examine the structure of the legs personally, though I have seen the species in Mr. Hill's collection. The transverse lines of the primaries are very distinctly traceable, and it differs in that respect from the previous group.

Lugens has the transverse lines of primaries very distinct, and there is a double white discal spot. The secondaries are blackish with narrow white bands. I consider Mr. Neumoegen's species, *separatus*, as a color variety of this species, the typical form of which has, so far as I am aware, never been found in the United States. Walker describes it from Mexico.

Eremitus resembles *lugens* very closely in appearance, but the transverse lines are very indistinct, and the longitudinal streakings heavier. The gemminate discal spot of primaries is the same, and the maculation of secondaries is also identical.

Plebeius differs obviously from all the species by the blackish brown secondaries. The eyes are distinct and very feebly lashed, and the palpi are well developed. The primaries are gray, with the markings heavy; no transverse maculation, and with a single white discal spot. The spurs of the middle and hind tibiæ are very long.

Cupressi has also concolorous, but brown primaries. The abdomen also is not banded, but has three longitudinal dusky lines. In

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maculation it resembles *sequoiæ*, but differs in the non-spinose middle tibia. It is another of these intermediate forms that upset so many and plausible systems. At first appearance it suggests an *Ellema* allied to *coniferarum*. I have seen but a single imperfect specimen.

It will be noted from what has been said above that while there is a possibility of dividing the genus into certain arbitrary groups, yet they are so closely related structurally and in ornamentation that it is impossible to create any divisions of generic rank.

In tabular form the scheme would appear as follows:

1. Anterior and middle tibiæ spinose.....2.
   Middle tibiæ not spinose.....7.
2. Dorsum of thorax discolorous, blackish .....3.
   Dorsum of thorax concolorous; patagiæ edged or lined with black.....4
3. Primaries yellowish brown.....**kalmiæ.**
   Primaries fuscous gray, with a reddish tint; costal region obviously paler. **drupiferarum.**
   Primaries dark gray, costal region not paler; no discal spot....**perelegans.**
   Primaries with white discal spot; with a fuscous tint; median band of secondaries somewhat indistinct.....**gordius.**
   Primaries without discal spot; with a brownish shade; secondaries yellow, without median band.....**luscitiosa.**
   Primaries gray, with costal region discolorous, pale; a submarginal black streak on primaries .....**albescens.**
4. Secondaries pale, whitish, banded with black.....5.
   Secondaries concolorous; brown.....6.
5. Costal region discolorous, paler; abdominal bands whitish.....**vashti.**
   Costal region concolorous.
   A black edging to patagiæ, and a black line through middle of each. **libocedrus.**
   A black edging only to patagiæ; size very large .....**chersis.**
   Costal region slightly discolorous; size small; abdominal bands beautiful creamy white.....**insolita.**
6. Size large; a more or less distinct transverse band near base from which radiate heavy black marks.....**piuastri.**
   Size smaller; no basal transverse band; dark bluish gray; longitudinal dashes between all veins.....**sequoiæ.**
   Pale gray; with two longitudinal dashes only; very small.....**dollii.**
   Pale gray; a fuscous oblique shade from inner margin, near base, to apex. **coloradus.**
7. Secondaries white, with two narrow black bands.....**elsa.**
   Secondaries black, with two narrow white bands.....8.
   Secondaries uniform brown or gray .....9.
8. Primaries without pale discal spot.....**canadensis.**
   Primaries with a gemminate white discal spot.
   Transverse maculation distinct.....**lugens.**
   Transverse maculation obsolete.....**eremitus.**
9. Primaries gray; with white discal spot; secondaries blackish.....**plebeius.**
   Primaries brown; without discal spot; secondaries brown.....**cupressi.**

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S. kalmiæ A & S.,* Ins. Ga. i, 73, pl. 37, *Sphinx;* Hüb., Verz. 141, *Lethia;* Harr.,* Sill. Journ. 36, p. 295, *Sphinx;* Wlk., Cat. Lep. B. Mus. Het. viii, 218, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 171, *Sphinx;* Morris,* Syn. 1862, 196, *Sphinx;* Lint.,* Proc. Ent. Soc. Phil. iii, 657; Harris,* Inj Ins. Flint ed. 328, *Sphinx;* Bd.,* Sp. Gen. Het. i, 91, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 620, *Sphinx;* Fernald,* Sph. N. E. 40, *Sphinx;* Grt., Hawk Moths 44, *Sphinx.*

Head and thorax chestnut brown above, white or yellowish laterally. Front whitish, palpi brown laterally. Patagiæ narrowly black edged and a fine blackish line margining the edge of the pale lateral shade. Metathoracic tuftings black. Dorsum of abdomen yellowish brown, with a narrow black dorsal line; laterally the abdomen is black, with the anterior edge of the segments white; the white scarcely forming bands, and not quite crossing the black shade. Beneath, thorax and abdomen dull white, with three or four blackish points along venter. Primaries very pale yellowish brown, the markings deeper brown. A brown shade along internal margin; from basal fourth of costa to basal fourth of internal margin and making a very wide bend outwardly and over the discal cell is a deeper brown line interrupted and giving rise to interspaceal brown dashes, a series of which extends obliquely nearly to the apex; just within and parallel to the outer margin is a whitish line, shaded on its inner side with blackish, broken by the veins; an oblique black line, edged above with whitish extends inwardly from the apex. All the fringes marked alternately with reddish brown and whitish. Secondaries dirty yellowish white, with a central and submarginal blackish band, the outer margin of the same yellowish brown as the primaries. Beneath, reddish brown on primaries with an indefinite and usually incomplete outer darker band. Secondaries a paler red brown, with the maculation of upper side more or less evidently reproduced, the median band dentate. Expands 3.25—4.50 inches; 81—112 mm.

Hab.—Can. to Georgia, Alabama westward to Missouri, Illinois and Wisconsin.

Probably found still further West and South, but I have no note of such localities. The species does not seem to vary much, and is very readily distinguished from all its allies by the color of primaries. The genitalia are very much as in *celeus* as to the supra-anal plate. The only male specimen I had for dissection seemed to have no distinct clasper, but I think that is error in observation and dissection. The side piece is as in *drupiferarum.* The larva has been several times figured, but never very carefully described.

S. drupiferarum S. & A.,* Ins. Ga. i, 71, pl. 36, *Sphinx;* Hüb., Verz. 141, *Lethia;* Harris,* Sill. Journ. 36, 294, *Sphinx;* Wlk., C. B. M. Lep. Het. viii. 218, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 172, *Sphinx;* Morris,* Syn. Lep. 1862, 197, *Sphinx;* Lint.,* Proc. Ent. Soc. Phil. iii, 658; Harris,* Inj. Ins. Flint ed. 328, *Sphinx;* Reed,* Can. Ent. iii, 5, figs. 1-3; Bd.,* Sp. Gen. Het. i, 97, *Sphinx;* Saund.,* Fruit Ins. 162, figs. 170-172, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 620, *Sphinx;* Fernald,* Sphing. N. E. 38, pl. 1, figs. 2-4, *Sphinx;* Grt., Hawk Moths 43, *Sphinx.*

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vancouverensis Hy. Edw., Pr. Cal. Ac. Sci. v, 111; id. vi, 93; Butl.. Tr. Zool. Soc. Lond. ix, 618, *Sphinx*; Holland, Can. Ent. xviii, 103, pr. syn.

Var. **utahensis** Hy. Edw., Pap. i, 115, *Sphinx*.

Top of head and dorsum of thorax dark brown. Front and thorax laterally light gray or whitish. The middle of the posterior part of thorax is brownish gray, with black tufts at each side. Abdomen brownish gray, with a black dorsal line; laterally is a broad black band with a series of white spots not cutting the band superiorly, but joining the pale under side. Beneath, the abdomen is white, with a narrow ventral and two subventral darker lines. Thorax darker gray, deeper anteriorly. Primaries dark, smoky brown, sometimes with a reddish tinge, light gray or whitish along the costal region from the base nearly to the apex and in width extending to the median vein. The outer margin is of the same color, widest at the anal angle and not reaching to the apex. The brown portion of the wing is covered by several very oblique, blackish brown, wavy or angulated lines, which appear on the costal portion as reddish brown streaks. The gray space along the outer border has a white line through the middle, parallel with the outer margin, and the space is limited within by a fine black line margined with white inwardly and angulated between the veins. The discal spot is represented by an oblique, fine black line, from which a double line of the same color extends in along the middle of the cell, and a single one outward on vein 5. An oblique apical streak extends in across the intervenular space and is nearly connected with another in the space below. There are also black dashes on the dark brown portions of the wing between veins 1 and 2, 2 and 3, 3 and 4, and also between 5 and 6. Secondaries blackish brown, with a whitish base, narrow central band and a brownish white outer border. All the fringes are smoky brown. The underside of the wings is dark gray with the outer border and a central band toothed on the veins in the hind wings, smoky brown. Primaries with a very faint reproduction of the markings of upper side. Expands 3.40—4.25 inches; 97—106 mm.

Hab.—Canada to Georgia; westward to California; Vancouver; Oregon, Colorado, Utah.

The supra-anal plate of ♂ is flattened, narrow, abruptly bent to form the flat pointed hook. The inferior process is short and broad, bifid at tip. The side piece is rather narrow, of the usual form. The clasper is stout, broad, corneous, inwardly concave, the inferior angle extended in the form of an index finger, the terminal margin irregular.

The species is readily recognizable by the contrast between the costal space and the very dark ground color. As is usual in the case of very widely spread species, there is some variation in size and ground color. To one of the Western forms of the species Mr. Edwards has applied the name *vancouverensis*. There is every intergrade between the two, and indeed specimens taken in the Eastern States are, I am informed, indistinguishable from typical Western forms. The differences can best be appreciated by quoting Mr. Edwards' description entire:

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Head dull gray, brownish on the occiput and sprinkled with brown hairs. Eyes dull black, surrounded by a blackish ring of hairs. Tegulæ wholly cinereous. Abdomen blackish gray, with narrow black dorsal line and six rather broad demi-bands of dirty white, blackish on the posterior margins of segments. Thorax and abdomen beneath dull brownish gray. Primaries fuscous, with a grayish space running from base to about half way along the middle of wing and an irregular submarginal band from internal angle to apex, the outer edge of which is deeply dentate; near the median nerve are three straight black dashes and a bent one toward the apex. Fringes brown, sprinkled with gray. Secondaries fuscous, with two dull whitish bands, slightly waved, the outer one parallel with the margin of the wing for three-fourths of its distance.

The variety *utahensis* is described by Mr. Edwards as much larger than the type form, of a grayer cast, without any trace of pinkish yellow. The primaries preserve the resemblance to the type form; the secondaries have the median band much broader, straight and not waved on its outer edge; it terminates also on the costa nearer to the base than in *drupiferarum*. The abdomen is a darker gray, and the demi-bands are reduced to small, oblong patches. It expands 4.50 inches, = 113 mm., and is from southern Utah.

A complete life history of the species has been written by Mr. Reed in the "Canadian Entomologist" iii, p. 5, with figures. Mr. Lintner has added a careful description of the pupa.

S. perelegans Hy. Edwards, Pr. Cal. Ac. Sci. v, 109. *Sphinx;* id. vi, 93, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 621, ? *Lintneria;* Pap. i, 105, *Sphinx.*

Head pale, silvery gray, black on occiput. Thorax with the tegulæ and sides gray; disc velvety black, uniting with the black on the upper side of head, and forming, when viewed from above, a long, triangular patch; centre of thorax gray at the base. Abdomen dark gray, sprinkled with black, with narrow black dorsal line. The five basal segments are equally divided into black and white demi-bands, the black being very intense and glossy; under surface of thorax gray, with central interrupted black line. Antennæ white above, dark gray beneath. Tibiæ grayish brown, with tarsi paler. Primaries fuscous, with many paler waved lines and a whitish space reaching from base over half way along the costa, but not extending to its edge. Resting upon this pale space are five bent black lines of unequal length, and a bent line at the apex reaching to the tip. Along the margin, from internal angle to apex, is a pale submarginal band, very faintly dentate externally, running parallel with the margin until it reaches the apex, where it spreads into a wider space, receiving the before-mentioned bent apical line. At the base of interior margin is a clouded black patch. The fringes are brownish black, dotted on their edge with six conspicuous white patches, which do not, however, entirely cross the fringe. The whole of the fringe on the interior margin is brownish black. Secondaries black, with brownish tinge; a broad, whitish band at the base, widest posteriorly; a narrow grayish white band crossing the wing obliquely, almost parallel with the margin, but slightly bent a little behind the middle. Fringes white, intersected with brown. Expands 3.64 inches; 41 mm.

Hab.—California.

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Mr. Edwards says this beautiful species closely resembles *Sphinx eremitus* Walk., of the Atlantic States, but is readily known by its more brilliant gray coloring, by the very sharply defined demi-bands and by the strongly marked, whitish submarginal band of the fore wings. The distinctive characters of this species have been already sufficiently discussed. I have not had specimens for dissection unfortunately. The early stages are unknown.

S. gordius Cram., Ex. iii, 91, pl. 247, fig. B, *Sphinx;* Hüb., Verz. 141, *Lethia;* Harr.,* Sill. Journ. 36, 295, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 218, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 173, *Sphinx;* Morris,* Syn. Lep. 1862, 198, *Sphinx;* Harris,* Inj. Ins. Flint ed. 328, *Sphinx;* Grt., Buff. Bull. i, 26, *Lethia;* Bd., Sp. Gen. Het. i, 91, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 618, *Sphinx;* Saund.,* Fruit Insects 86, fig. 85, *Sphinx;* Fernald,* Sphing. N. E. 44, pl. 1, fig. 1, *Sphinx;* Grt., Hawk Moths 45, *Sphinx.*

poecila Steph., Ill. Brit. Ent. Haust. , 123, *Sphinx;* Wood, Ind. Ent. 246, pl. 53, fig. 26, *Sphinx;* G. & R., Pr. E. S. Phil. v, 165, pr. syn.

Front of head, palpi and thorax laterally, gray. Palpi at sides, vertex of head and disc of thorax blackish brown, with black metathoracic tufts, between which there are some gray hairs intermixed with the brown ground. Abdomen ashy gray, above with a dorsal black line and a broad black lateral band cut with white on the first four or five segments, forming thus a series of alternate black and white demi-bands. Beneath, thorax and abdomen gray. Primaries gray, more or less clouded with brown. The discal spot is small, white, triangular, and from it two fine black lines extend in along the cell, uniting at a variable distance from the end of cell. The median vein and veins 2, 3. 4, 5 and 6, are marked with black, and there are black dashes between all the veins below the apex, the last forming the oblique apical streak. An indistinct ashy gray shade crosses the wings at basal fourth; another still more distinct from the costa a little beyond the middle, ends at the middle of the hind margin, and a third, equally indefinite, crossing a little beyond and parallel to the last is somewhat toothed on the veins. Outside of this, nearly parallel with the outer margin, is a distinct white shade, not reaching the apex, through which runs a variably distinct blackish brown line. A brown spot on costa before apex leaving a white shade above the apical black streak. Fringes brown, cut with white. Secondaries sordid white, with a rather indefinite central band and a broad blackish outer margin. Fringes white, narrowly cut with black. Beneath, the primaries are brownish gray, the fringes as above; the secondaries are gray, with a narrow central and broad terminal band of dark brownish gray. Expands 3—3.60 in.; 75—90 mm.

Hab.—Canada to Georgia; westward to the Mississippi.

Probably this species ranges further West, but I have no definite information that it does so.

The supra-anal plate and attached claws offer nothing that is unlike the general structure in the genus. The side piece is oblong, the tip oblique. The clasper is very stout and large, corneous, broad,

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concave; the inferior angle produced into a stout, long and pointed process slightly curved, the margin serrate. Altogether it is a formidable looking structure.

There is a considerable variation in intensity of color in this species. The above description was drawn from a rather uniformly gray specimen. Others occur in which there is a very distinct yellowish cast to the whole upper side, and all the black markings are intensified. In this form the interspaceal dashes are forked—united basad the wing and thence spreading. Between veins 5 and 6 is a more or less perfect and very elongated loop. This marking closely approaches that of *luscitiosa* in type.

From all the previous species the distinct discal dot and broadly blackish margined secondaries will prove distinctive.

Little is known of the larval history; the same general description from Harris forms the base of the knowledge we have. I am not aware that it has been frequently raised.

S. luscitiosa Clem., Journ. Ac. N. Sci. Phil. iv, 1859, 172, *Sphinx;* Morris, Syn. Lep. 1862, 197, *Sphinx;* Wlk., C. B. M. Lep. Suppl. 31, p. 36, *Sphinx;* Grt., Buff. Bull. i, 26, *Lethia;* id. ii, 228, *Lethia;* Strk., Lep. Rhop. et Het. 114, pl. xiii, fig. 11, ♀, *Sphinx;* Grt., Buff. Bull. iii, 225, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 618, *Sphinx;* id. 642, *Lethia;* Fernald, Sphing. N. E. 45, *Sphinx;* Grt., Hawk Moths 44, *Sphinx.*

Head, except vertex and sides of thorax, yellowish or gray. Vertex and disc of thorax black, the latter with gray scales intermixed posteriorly. A broad brown stripe extends from the middle of the palpi, back under the wings. Abdomen in the ♂ dull ochre yellow, with a fuliginous dorsal line and irregular dull smoky markings; in the ♀ the dorsum is gray, with a distinct blackish dorsal line and a broad lateral black band anteriorly cut on the segments by narrow, dull yellowish white, demi bands. Beneath, thorax and abdomen gray. Primaries yellowish gray, with the margins sooty brown. The band on the outer margin is broader at inner angle and does not reach the apex; the inner edge is wavy, and there is a parallel wavy brown line just within. A darker, smoky shade on costa before apex. The centre of the wing is paler, more grayish, more or less of the veins are black and a black line extends in along the middle of the cell from the minute concolorous discal dot; this line is double at first, but the two parts unite inwardly. A short, black, generally outwardly furcate black dash between the veins as far as the apex, the last two forming the bent apical streak. The first below this apical streak is in the form of an extremely elongated loop. Fringes dark, very narrowly cut with pale yellow. Secondaries bright ochre yellow in the ♂, grayish in the ♀, with a broad black border and a faint indication of a central band. Fringes yellowish; the under side of all the wings is dull ochre yellow, with broad terminal black bands. Expands ♂ 2.50, ♀ 3 inches; 62—75 mm.

Hab.—Canada to Virginia; along Atlantic coast; westward to the Mississippi; Wisconsin.

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The male of this species is always smaller, more yellow; the primaries more pointed, outer margin almost rigidly oblique. In the ♀ there is a subdued gray shade, the wings are broader, and the outer margin is more convex. The species is a very distinct one, most nearly allied to *gordius*, with which it agrees perfectly in tibial armature as well as general habitus. Its yellow secondaries, lacking all but a trace of the central band, and the minute, concolorous discal spot, as well as general ground color of primaries are distinctive, and render the species easily recognized.

The genitalia of the ♂ while on the same general plan as in *gordius*, yet differ obviously. The side piece is shorter and broader, the clasper is equally stout, broad, concave, but both the angles are produced into long processes the lower pointed at tip and longer, the upper with a rounded tip.

The species has been frequently raised in the vicinity of New York on willow, but no description has been made, and I have been unable to get hold of any preserved specimens of the larva. This lack in our knowledge of *Sphinx* larva ought to be soon filled.

The species is very rare.

S. albescens Tepper, Bull. Bkln. Ent. Soc. iv, 1, pl. fig. 3, *Sphinx*.

Head light gray; antennæ white above, dark gray beneath; collar and shoulder covers whitish gray, the latter heavily edged with black inwardly. Dorsum of thorax deep blackish gray. Abdomen gray, with a black dorsal line edged with gray at the sides, laterally banded with white and black; beneath uniform dark gray, with a black ventral line. Legs gray. Primaries gray, shaded with cinereous white along the costa for about half of the wing; a rather heavy black, apical line, and one near outer margin, the first shaded inwardly and the last outwardly with whitish gray; between these lines and the light costal field are several black streaks; under side gray, powdered with white along the costa and outer margin; the black apical line is reproduced, and there is a wavy dark line, double at inner margin, and bordered outwardly with whitish gray. Secondaries white at base, followed by a narrow black band, then a narrow white one, both drawn to a sharp point at anal angle; beyond this is a heavy black band shaded with gray towards exterior margin; under side much as above, but the bands and shadings are not so heavy. Fringes of all wings gray. Expands 2.75 in.; 70 mm.

Hab.—Colorado.

Mr. Tepper distinguishes this species from *vashti* Strk., by the dark dorsum of thorax and the form of the bands on secondaries, which are angulated opposite the anal angle. This latter is an evanescent character, and only the dark thorax remains to distinguish the two. I have not seen any intermediate specimens. This species forms a

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complete connection between these two groups of *Sphinx*, having the thoracic maculation of the one, the wing maculation of the other, somewhat modified, however, in the direction of the first, while the armature of the legs is like that of *chersis*.

Unfortunately all the specimens of this species and *vashti* at my command are females, therefore I cannot give any idea of the genital structure. The early stages are entirely unknown thus far.

S. vashti Strk., Lep. Rhop. et Het. 136, pl. xv, fig. 4, ♂, *Sphinx;* Grote, New List 1882, = *vancouverensis;* Holland, Can. Ent. xviii, 103, an sp. dist.

Ash gray, head and thorax more whitish. Palpi laterally brown. Vertex of head slightly darker, as is also the prothorax. Patagiæ edged with black; metathoracic tufts also black, and a few irregular black lines at base of thorax. Abdomen with dorsum dark gray, with a distinct median black line. Laterally there is a broad black band interrupted by a series of white demi-bands, which do not always entirely cross the black shade. Beneath, dull gray; venter with a distinct black median line. Primaries ashen gray; a whitish shade from the base through the costal region narrowing outwardly and a white submarginal shade broader toward anal angle and not quite attaining the apex. Below the pale shade toward base of wing is a darker smoky gray shade. The veins are narrowly black marked, and there is a long, slender black line between veins 1 and 2, and another through the outer part of median cell, and thence close to vein 5. Other short interspaceal dashes to apex, where two unite to form the usual oblique apical streak, which is superiorly margined by white scales. Inwardly marking the pale submarginal shade is a distinct oblique black streak, within which is a parallel brown line. The fringes of both wings are evenly gray. Secondaries whitish with a blackish, median, and subterminal band. Beneath, primaries ashy gray, with a transverse outer, oblique line, faintly reproducing that of the upper side, a faint median band and a reproduction of the apical dash of upper side. Secondaries reproducing the maculation of the upper side, but much more whitish. Expands 2.75 inches; 70 mm.

Hab.—Arizona, Montana.

The resemblance of this species to *albescens* Tepper, has been already noted. The structure is practically identical. No male of this species was available for examination, and nothing is known of the early stages.

S. libocedrus Hy. Edw., Pap. i, 115.

At first sight looking like a small example of *S. oreodaphne*, but differing greatly when carefully examined. Color the same as that of *S. chersis*, with the same black dashes upon the primaries, that along the median nervule, which is frequently wanting in *oreodaphne*, and sometimes in *chersis*, being here well defined and reaching almost to the base of the wing. The ground color of the secondaries is a clear white, and the median band stands out in stronger contrast than in either *chersis* or *oreodaphne*, while the gray dorsal space of the abdomen, traversed by a black line, is narrower than in either of the other forms, and the demi-bands comparatively larger and clearer white. In *chersis* and *oreodaphne*

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the thorax has the tegulæ edged inwardly with black, in the form of a long triangle. In *libocedrus* this mark is present, and in addition the tegulæ themselves have a distinct black streak, reaching to the base of the head, not observable in either of the others. The under side of the wings is paler gray, with the median band of secondaries very strongly marked. Expands 2.50 inches; 62 mm.

Hab.—Prescott, Arizona.

This species I have casually noticed in Mr. Edwards' collection, but without making any closer study of it. It is apparently a much smaller species than *chersis* and more evenly colored than *vashti*. It probably has a similar tibial armature to *vashti*. So far as I am aware nothing is known of the early stages.

Since the above was written a specimen has turned up among the Belfrage material in Prof. Riley's collection, now in the Museum. It has been submitted to Mr. Edwards, who confirms my identification. It agrees very well with Mr. Edwards' characterization save that the demi-bands of abdomen have a decided yellowish tinge and the markings of the secondaries are obscure and not as prominent as in the type. The specimen is unfortunately a ♀, and the species is a good one I believe. The armature of tibia and fore tarsi does not differ in any important particular from that of *chersis*.

S. chersis Hüb., Samml. ii, pl. 380, *Lethia;* G. & R., Pr. E. S. Phil. v, 165, 190, *Sphinx;* Beth.,* Can. Ent. i, 17, *Sphinx;* Bd.,* Sp. Gen. Het. i, 93, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 617, *Sphinx:* Edw, Pap. iii, 127; Fernald,* Sphing. N. E. 42, *Sphinx;* Grt., Hawk Moths 44, *Sphinx.*

cinerea Harr.,* Sill. Journ. 36, 295, *Sphinx;* Wlk.. C. B. M. Lep. Het. viii, 217, pr. syn.; Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 169, *Sphinx;* Morr.,* Syn. 1862, 194, *Sphinx;* Lint.,* Pr. E. S. Phil. iii, 655; G. & R., Pr. E. S. Phil. v. 165, pr. syn.; Scud.,* Psyche ii, 76; Bd., Sp. Gen. Het. i, 93, pr. syn.; Hagen, Pap. iii, 62.

oreodaphne Hy. Edw., Pr. Cal. Ac. Sci. v, 109 1874, *Sphinx;* id. vi, 93, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix, 618, *Sphinx;* Strk., Lep. Rhop. et Het. 142, pr. syn.; Butl., Pap. i, 104, an sp. dist.; Holland, Can. Ent. xviii, 103, pr. syn.

Head, palpi and thorax ashy gray. A brownish stripe extends from the apex of the palpi to the eyes, and is continued as a black line along the side under the wings. The patagiæ are edged above with black, and the metathoracic tufts are of the same color. The abdomen is ashy gray, with a central black line, and a broad black band on each side broken by four or five white demi-bands. The under side is paler than above, and has a row of small black spots along the middle of the abdomen. The primaries are ashy gray, with a dark smoky brown cluster of hair like scales at the base, behind the origin of vein 1. The discal spot is not usually perceptible, but a black line runs along the middle of the outer part of the cell, crossing the position of the discal spot. There are black dashes between all the veins below the apex, the last two often uniting in an ob-

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lique apical streak. There are two or three light and dark, somewhat wavy subterminal shade lines, which do not reach the costa. Of these the outer is black and is outwardly margined with white scales. Secondaries pale gray with dark blackish brown median and submarginal bands. The fringes are all pale ashy gray, cut with deeper gray. The under side of all the wings is ashy gray with an ill-defined terminal band, a dentate central line on the secondaries, continued on the primaries, all a little darker than the ground color. Expands 4—5 in.; 100—125 mm.

Hab.—Canada to Georgia; westward to California.

The supra-anal plate of the ♂ genitalia is essentially like that of *chersis*. The side piece is large, oval; the clasper broad, flat, giving off from the upper margin a very long, slender spur, pointed at tip; the terminal portion of main part of clasper is straight. There is little variation in this species, except in size. There are everywhere the same ashy gray color and the same longitudinal dashes. The only variation is in the number of these.

Mr. Edwards described the Californian form of the species as *oreodaphne;* afterward he, himself, placed it as a variety of *chersis:* then it got back to the lists somehow as a good species, and Mr. Butler said that if the form is local and constant it is entitled to a name. Last of all Dr. Holland shows that it is not local and not constant, and therefore not entitled to a name.

I think, myself, that Dr. Holland is correct, and that the name applies merely to a slight geographical variety of the same form. I give, however, Mr. Edwards' original description, which will speak for itself:

"Thorax pale, ashy gray, slightly sprinkled with black hairs, and with a well defined triangular black mark, the vertex of which rests on the prothorax, its sides reaching to and joining the basal black demi-band of the abdomen. The area inclosed by the triangle is pale gray. Abdomen above, gray sprinkled with black, with narrow black dorsal line, and seven demi-bands of rich velvety black, the basal one becoming almost circular in form, and uniting with the triangular mark on the thorax. Thorax and abdomen beneath wholly pale gray as also are the legs, the tarsi being very faintly sprinkled with black. Primaries wholly pale gray, with narrow black longitudinal lines, only slightly bent, the two largest resting on the centre of the median nerve. Along the posterior margin is a whitish, irregular, submarginal band, not reaching to the internal angle. Secondaries blackish fuscous, with two undulating white bands, the outer one not quite reaching to the apex. Fringes of primaries brownish, sprinkled with gray; those of secondaries white, very indistinctly mottled with brown.

The heavy armature of the fore tibia and tarsi is very much like that of *P. celeus*, but in addition the fore and middle tibiæ are heavily spinulose.

The larva and pupa have been described quite fully by Mr. Lintner in Proc. Ent. Soc. Phil. iii, 655.

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S. insolita Lint., Pap. iv. 145, *Sphinx.*

Head, prothorax and tegulæ gray as in *Sphinx plebeia;* prothorax crossed by two black lines, nearly continued on the black bordering of the tegulæ, which also bear an indistinct black median streak. Abdomen dark gray above, with a narrow black dorsal line which is not so broad as in *S. eremitus;* beneath paler, with a black mark mesially on each segment, broader on the anterior portion, forming an elongated triangular spot acute posteriorly, a broad black band bearing five transversely elongated demi-bands of a fine creamy white color on the anterior portion of the segments. Primaries narrow, acute, slightly rounded costo-apically; outer margin nearly straight; inner margin but slightly excavated. General color ashy gray near to *S. cinerea;* crossed by three brown bands, of which the inner one arises at or near some interno-basilar lines and black basilar patch, and runs obliquely toward the cell, in which it is apparently sharply deflected toward the centre; the following two bands run from the internal margin at its middle; the median one runs with an inward curve to opposite the cell, whence it is directed towards the costa at its outer third at nearly a right angle to the costa; the outer and narrower band is angulated on the submedian fold, and thence approaching the outer margin to opposite the cell (its course beyond not traceable in the specimen); following the band is a narrow black line parallel to it, which is outwardly bordered with a whitish shade; cilia white, marked with black opposite the nervules. The veins and the submedian fold have apparently been clothed with black scales; cells 3–8 bear distinct black streaks, the last two of which form a nearly direct line, disconnected only by vein 7. There is an indication of a small white discal spot. Secondaries narrow, acute, with a broad black border widening toward the costa; a nearly straight, central, black band, separated from the preceding by a narrower grayish band, and by a still narrower one from the black basilar space. Beneath, a median band, which is a continuation of a similar one on the primaries. Expands 2.60 inches; 65 mm.

Hab.—Texas, Rio Grande.

The unique ♂ type is in Mr. Lintner's collection, where I had an opportunity to examine it. The eyes are not very distinctly lashed. The legs are subequal, rather like those in the first group, and the heavy spinulation of fore tibia and weak armature of the tarsi also agrees with that group. The spurs of middle and hind tibiæ are short. The species is a distinct one, and will be easily recognizable I think. The description is almost a transcript from Mr. Lintner's original characterization of the species. Nothing is known of the early stages.

S. pinastri Linn., Syst. Nat. ed. x. 492, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 642, *Hyloicus.*

saniptri Strk., Lep. Rhop. et Het. 118, pl. xiii. fig. 18, ♂; id. 143, pr. syn.

Dark ashy gray; edges of collar and patagiæ black; metathoracic tufts also black. Dorsum of abdomen gray, with a dorsal black line. Laterally, a series of alternate white and wider black demi-bands. Primaries rather evenly colored. A distinct transverse black line from basal third of costa, widely curved outwardly and then running inwardly to the inner margin close to base; some-

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what beyond the middle of costa is the inception of a second band, extending, however, but a short distance toward the disc. An apical oblique black streak and short, rather heavy black dashes between most of the veins. Fringes pale, cut with dark gray. Secondaries brownish gray, darker outwardly. Expands 3 inches; 75 mm.

This description is made from a specimen of *pinastri* (European) which agrees perfectly with Mr. Strecker's figure. Mr. Strecker's description is comparative wholly. He says: "Male expands three inches. Upper surface in color and ornamentation same as the European *S. Pinastri* L., with this exception—that the latter has two broad, transverse brown bands on primaries, the outermost of which is entirely wanting in the present insect, and the innermost is quite narrow and darker in color than in *Pinastri*. Under surface brownish gray, faint traces of a mesial band on secondaries. In *Pinastri* are the marginal parts of primaries a little paler and more ashen than the rest of the wing; in this species there is no perceptible change in the coloration.

"Female expands 3¾ inches.

"Head and body same color as the male, destitute of all markings save a faint apical line and the obscure streaks in cells between the median nervules near the median nervure.

"Under surface uniform dull grayish brown.

"Described from one ♂ and one ♀ example. The former was captured in Canada, and was received by me from Mr. Reakirt; the female I took sitting on a fence near some pine woods a mile from Reading, Pa. I have never seen any others. Both examples are in good condition, though the female is a little worn; they seem to me to be an intermediate form between *Sequoiæ* and *Pinastri*, though very close to the latter.

"Some years ago in the month of October, crawling among the dead pine leaves in this same piece of woods, I found two larvæ which belonged to some insect of this group, perhaps to this species. My notes say: 'Not quite three inches long, rather slender, head yellow striped with red; body reddish, surrounded with many transverse fine black lines; a brown stripe on back from head to anal horn, this stripe lined with white on both sides; on sides alternate bands or lines of green and yellow, green predominating from head to last segment (save one); caudal horn dark reddish brown; first few spiracles white, the others ringed with red and black; from base of anal horn to end of anal segment a reddish brown dorsal line.'"

The larvæ were not carried to maturity.

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In a later number Mr. Strecker positively identifies this species with *pinastri*.

I am not quite ready to believe him correct. I would rather believe in a species closely resembling the European form, but not identical with it.

I have given none of the European bibliography as that can be readily gotten from any European work on Lepidoptera. I shall watch with interest the reappearance of this species. In the European form the spurs of middle and hind tibiæ are very long, the former not spinose. Anterior tibiæ sparsely spinose, the first tarsal joint with longer outer spines; the armature not very heavy.

S. sequoiæ Bd., Lep. Cal. 1869, 66, *Sphinx;* Hy. Edw., Pr. Cal. Ac. Sci. 1873, 93; Grt., Buff. Bull. i, 27, *Hyloicus;* id. ii, 228, *Hyloicus;* Bd., Sp. Gen. Lep. Het. i, 101, *Sphinx;* Strk., Lep. Rhop. et Het. 117, pl. 13, fig. 17, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 616, *Hyloicus.*

♂ **coniferarum** Wlk., C. B. M. Lep. Het. viii, 224; Butl., Tr. Zool. Soc. Lond. ix. 616, pr. syn.

Head and thorax light gray, sprinkled with black, with two indistinct black lines on the occiput, reaching to prothorax, and thence spreading towards the sides of the tegulæ. Abdomen gray, with black dorsal line. The segments are whitish at their base, the five posterior with a black sublinear patch on their outer edges. Antennæ white above, gray beneath. Feet wholly gray, spotted with black. Primaries gray, indistinctly dotted with black, with four or five very faint black lines, the longest near the apex. Fringes grayish brown, intersected with white. Secondaries grayish fuscous, entirely without bands. The fringes are white, intersected with brown, except toward anal angle, where they are wholly whitish. Expands 2 inches; 50 mm.

Hab.—California.

The anterior and middle tibiæ of this species are very heavily spinose, as is also the first tarsal joint, which has the heavy outer armature of *chersis*. The legs are, however, rather short, and the spurs are weak. This makes one of the intermediate forms between *Sphinx* and *Hyloicus*, and prevents the separation of the latter as a distinct genus.

The species is a neatly marked and very recognizable one, as the description, which was taken from Edwards, shows. I have not been able to examine the ♂ genitalia.

Mr. Strecker gives an excellent figure of this species in Pt. XIII, p. 117, pl. xiii, fig. 17, of his work.

Mr. Edwards in recording the first capture of a specimen states that it was hovering at mid-day over a pool of water, darting down occasionally to drink.

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Dr. Boisduval's specimen was found sitting on the bark of a Red wood tree—*Sequoia sempervirens.*

S. dollii Neum., Pap. i, 149, *Hyloicus;* Grt., New List 11, *Sphinx.*

Head light gray, with two black spots near antennæ. Antennæ brownish, with light gray pectinations. Collar light gray; thorax and patagiæ whitish gray, with two broad dark gray stripes along tegulæ accentuated with black at their commencement at collar. Primaries light gray, shading off into whitish towards base; costal edge darker gray. Fringes whitish, with darker gray spots alternately at the intersection of the veins. A blackish dash from apex pointing diagonally towards base and fading away in the discoidal veins. Two short blackish dashes between first and second, and second and third median veins, parallel with the neuration. Secondaries uniform brownish gray with fringes alternately dark gray and white. Beneath uniform cinereous with the blackish trace of the apical diagonal dash of primaries. Abdomen pale gray, with a black dorsal line, and black and white lateral intersections at segments. Expands 1⅞ inches; 50 mm.

Hab.—Prescott, Arizona.

Nothing is known of the early stages of this species.

S. coloradus Smith, Ent. Am. iii, 153.

Fuscous or ashen gray, dorsum of thorax a little darker. A broad deep brown band from base of antennæ, forming thence a broad margin to the patagiæ; this band narrowly margined with white on either side. Metathoracic tufts also blackish. Abdomen with dorsum fuscous or brownish gray with a dorsal line. A broad lateral black band interrupted by having the segments narrowly white margined. Beneath dull ashen gray. Primaries with a whitish shade through the centre of wing from base to apex, this shade inferiorly margined by a deeper, more brownish gray. Through this darker shade is a series of short, interspaceal black marks, the apical oblique dash formed of three of these dashes joined by the dark shading. Parallel with and near to the outer margin is a somewhat sinuate black line, with a paler gray shading on either side; the line reaching neither the inner margin nor the apex. Fringes pale, cut with darker gray. Secondaries brownish gray immaculate; fringes pale, cut with darker gray. Beneath, uniformly brownish gray, with the apical dash faintly reproduced. Expands 2.12 inches; 28 mm.

Hab.—Colorado.

A single male specimen in Mr. Graef's collection. The species is well marked, and the only one in the group with immaculate secondaries, which has a paler longitudinal shade, which, with its darker inferior marking, is characteristic of the species. The palpi are small; fore and middle tibiæ spinose; first joint of fore tarsi armed with longer spines outwardly. The spurs are short and weak.

S. elsa Strk., Lep. Rhop. et Het. 126, pl. xiv, figs. 4 and 5, *Sphinx.*

Head and thorax white, with black powderings, more dense on disc, which thus appears gray. The patagiæ margined with black, and dull orange yellow. Metathoracic tufts black, as is the basal segment of abdomen. The latter is

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whitish gray, with a black dorsal line and the posterior edges of segments black, usually forming complete rings. Primaries white, with black powderings. An apical, oblique black streak and a series of three oblique black shade lines from the inner margin obliquely outward, reaching only to a little above the middle of wing. A submarginal narrow black shade from apex nearly to hind margin within anal angle. The lower half of the wing is most densely black powdered, and there is an orange tint over a greater or less portion of the surface, most prominent usually in the male, which also is more heavily black powdered than the female. Secondaries white, with a basal spot, a medial and a submarginal narrow black band. Beneath white, powdered with black, very distinctly and densely on disc of primaries, which have also an outer transverse dark band and an apical streak. Secondaries with markings of upper side reproduced. Expands 2.75—3 inches; 68—75 mm.

Hab.—Arizona.

A very distinct and readily recognizable species, differing from all the other American species by its pure white ground color. The antennæ are very stout, black, in the ♂ with distinct serrations.

The spurs of middle and hind tibiæ are short and weak, and the fore tibiæ only are sparsely spinose. The outer side of first joint of fore tarsi with a series of three or four long outer spines or claws.

I have not had a male for dissection, and the species is not common.

S. canadensis Bd., Sp. Gen. Het. i, 93, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 629, ♀ = *leucophæata;* Fernald, Sphing. N. E. 43, *Sphinx;* Grt., Hawk Moths 44, *Sphinx.*

plota Strk., Lep. Rhop. et Het. 106; id. 115, pl. xiii, fig. 13; id. 142, pr. syn.

Head, thorax and abdomen light brownish gray. The patagiæ are edged with black, and there is a dark line through the middle, below which the sides of the thorax and head above the eyes are paler than above. Metathoracic tufts black. The abdomen has a central black line and a broad black band more or less broken by sordid white on the edges of the segments along each side. The under side is lighter than above, and has a central black line and a similar one on each side of the abdomen. The primaries are light brownish gray with a cluster of blackish hair-like scales at the base below the origin of vein 1. The wings are crossed by several very oblique cross lines, visible only on the costa and near the base of inner margin. A subterminal black line edged with whitish extends nearly to the apex, followed by another within. Black dashes occur between the veins as far as the apex. Secondaries pale gray, with a spot at base, a central and a subterminal band dark smoky brown. The terminal space is brownish gray. The under side of all the wings is brownish gray with a darker, dentate central band on the middle of the secondaries. Expands 3.25—3.60 inches; 81—90 mm.

Hab.—Newfoundland, Canada, Maine, New York, Ohio.

This rather rare species was taken in Bangor, Me., on flowers, in July, according to Prof. Fernald. Mr. Strecker figures the species very accurately, and says he has heard of its being taken in various parts of the country. In Mr. Hill's collection I saw a specimen taken

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by him in the Adirondacks. It resembles *gordius* at first sight in color and maculation, but lacks the dark dorsum of thorax, and there are other differences as well.

Prof. Fernald quotes a letter from Mr. Thaxter as follows: "I found two small Sphinx larvæ ready for their last molt, last summer [1885] on the 'bake apple' marshes in Newfoundland, as the high, open peat bogs there are called. One was on the bake apple (*Rubus chamæmorus*), the other creeping among the low Ericaceous plants and both fed in confinement on low bush blueberry. They were much like *S. drupiferarum* and *S. gordius*, but differed noticeably from either. Unfortunately I lost them before taking a description. Near by on the marsh I found a battered dead female *S. canadensis*, and have little doubt that this larva was of the same species."

Nothing else has been published on the early stages.

S. lugens Wlk., C. B. M. Lep. Het. viii, 219, *Sphinx;* Grt., Buff. Bull. i, 26, *Agrius;* id. ii, 228, *Agrius;* Bd., Sp. Gen. Het. i, 87, *Sphinx;* Snow,* Observer of Nature, iii, No. 1; Strk.,* Lep. Rhop. et Het. 115, Pl. xiii, fig. 12, ♀; id. p. 142, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix, 618, *Sphinx.*

eremitoides Strk., Lep. Rhop. et Het. 93, *Sphinx;* id. 115, pr. syn.; Grt. Buff. Bull. ii, 150, pr. syn.?; Butl., Tr. Zool. Soc. Lond. ix. 621, *Lintneria.*

merops Bd., Lep. Guat. 73, *Sphinx;* Sp. Gen. Het. i, 87, pr. syn.

andromedea Bd., Lep. Guat. 1870, 74, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 618, pr. syn.; Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 65, an sp. dist.

sordida ‡ Clem., Journ. Ac. N. Sci. Phil. iv. 169, *Sphinx;* Morris, Synopsis Lep. 1862, 194, *Sphinx.*

separatus Neum., Ent. Am. i. 92, *Sphinx.*

Head, thorax and abdomen of mouse gray color, with darker shades on prothorax and thorax, shading laterally into whitish gray. Lateral lines of prothorax and patagiæ prominently marked in black, inner marginal line hardly distinguishable. Gray dorsal band on upper side of abdomen with a black dorsal central line ornamented with black segmentary bands. Primaries of mouse gray color, with markings as in *Sphinx lugens* Wlk., in brownish black, but the apical diagonal dashes, the undulating transverse line which runs partly along outer margin and in an irregular bend turns and rests within the central part of inner margin, as well as the two horizontal dashes between the median nervules, much more prominent and pronounced than in *lugens.* The space between interior and anterior transverse line and along costa, above discal spots of brownish hue, leaving in discal cell and above centre of inner margin interspaces of grayish white. A round basal black blotch. Secondaries whitish gray, with large marginal and prominent medial bands of brownish black, the color in marginal band fading into gray towards anal angle. A black basal blotch. Fringes on primaries and secondaries whitish gray, ornamented with dark brown at intersection of veins; less marked in secondaries. Below, legs and abdomen mouse gray. Primaries

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and secondaries brownish gray, the basal regions shading into light gray and assuming a whitish tint near anal angle of secondaries. The anterior transverse line on primaries and the marginal and medial bands on secondaries well pronounced. Fringes as above. Expands 4—4.50 inches; 100—112 mm.

Hab.—New Mexico, Texas, Southwestern States.

The description above is Mr. Neumoegen's description of *separatus*, and with which about all the specimens from the United States I have seen agree very well. Walker describes *lugens*, from Mexico, as "Blackish gray, paler beneath. Head and thorax paler on each side. Thorax with two black stripes. Abdomen with interrupted white and blackish bands. Fore wings slightly tinged with brown, with costal marks and with discal and exterior streaks; two whitish discal dots, the fore one occasionally obsolete. Hind wings black, with two whitish undulating bands; ciliæ white."

In addition may be mentioned that in this species the transverse lines are very distinct, recalling the maculation of *Ceratomia*. The t. a. line is gemminate with a very strong outer band. The t. p. line consists of three dark, with intermediate paler shade lines not very distinctly marked, and very strongly dentated on the veins.

Mr. Neumoegen adds to his description of *separatus:* "This stately insect has been for many years confounded with *Sphinx lugens* Wlk., which comes from Mexico, although a few specimens have been found in our Southwestern States. *Lugens* Wlk., is a considerably smaller insect, of a brownish olive tint, with delineations not so prominently marked, and faint basal blotches. The excellent figure of Mr. Strecker's *Sphinx lugens* Wlk. (H. Strecker's No. 13, fig. 12), would do well for *Sphinx separatus* if the color were changed and the other differences prominently marked." The original of Mr. Strecker's figure came from Prof. Snow, who also sent Mr. Neumoegen specimens. There is no doubt that the insects received by Mr. Strecker and Mr. Neumoegen belong to the same species. The Museum collection contains also a specimen from Prof. Snow which agrees very well with Mr. Neumoegen's description and Mr. Strecker's figure. This same Kansas form described as *separatus* was previously described by Strecker as *eremitoides*. Specimens compared from Mexico show only the differences in color between fresh specimens of the Kansas form; in older, more faded specimens the difference is not noticeable.

Mr. Strecker quotes Prof. Snow's description of the larva in the "Observer of Nature" which I have not seen. The species is very

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closely allied to the Eastern *eremitus*, with which it agrees in tibial and tarsal armature. No ♂ has been available for dissection.

S. eremitus Hüb., Samml. ii, pl. 379, *Agrius;* Wlk., C. B. M. Lep. Het. viii. 221, *Sphinx;* G. & R., Pr. E. S. Ph. v. 165, *Sphinx;* Beth., Can. Ent. i, 17; Grt., Buff. Bull. i, 26, *Agrius;* Bd., Sp. Gen. Het. i, 90, *Sphinx;* Fyles,* Can. Ent. xi. 59, *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 620, *Lintneria;* Grt., Buff. Bull. iii, 225, *Lintneria;* Fernald,* Sphing. New Engl., 46, *Sphinx;* Grt., Hawk Moths 45, *Sphinx.*

sordida Harr., Sill. Journ. 36, 296, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 219, *Sphinx;* G. & R., Pr. E. S. Ph. v. 165, pr. syn.

Head, palpi and thorax brownish ash colored. A brown stripe extends along the outer side of the palpi and a black line extends from the eye along under the wing. A broad black stripe extends through the middle of the patagiæ, and they are edged above with black. Metathoracic tufts black. The abdomen is brownish ash colored with a black dorsal line, and a broad black band broken by white on the edges of the segments along each side. Primaries brownish ash colored with a white discal spot set on a black longitudinal dash, above which at the upper angle of cell is another, smaller white spot. There are heavy black dashes between the veins from the first to the apex. A pair of blackish brown stripes start from the costa a little outside of the base, run out to the median vein where they form an acute angle and are usually obsolete, and then across the hind margin near the base. Another, very indistinct pair crosses the wing at outer fourth somewhat dentate on the veins and marked only on the costa and inner margin. A subterminal line from costa near apex, accompanied by a pale shade, becoming whitish below the apical streak, while the margining line becomes black and somewhat irregular. Fringes brown, narrowly cut with white. Secondaries black with a basal and narrow median gray band. Fringes gray, darker at anal angle. Beneath, primaries dark ashy gray, with a faint subterminal line slightly paler; secondaries dirty whitish with a black median band, dentate on the veins, and a broad blackish marginal band. Expands 2.50—3.15 inches; 63—79 mm.

Hab.—Canada, Atlantic and Central States.

This species is closely allied to *lugens*, but is smaller, much darker, the longitudinal dashes heavier, the transverse lines with difficulty traceable, and not nearly so strongly dentated on the veins—in fact the lines are scalloped rather than dentate.

Clemens evidently mixed up *lugens* and *eremitus*, his descriptions applying throughout rather to the former than the latter.

The spurs of median and posterior tibiæ are long and stout. The fore tarsi have three outer long claw-like spines. The genitalia are of the usual type. The inferior process of the supra-anal hook is short and broad, the upper long, curved and flattened. The clasper is corneous, broad, somewhat ladle shaped, with the margin dentate and serrate.

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Messrs. Fyles, Lintner and Fernald have together given a very fair description of the larva, though Mr. Fyles in some way mixes up Strecker's notes on *lugens* with *eremitus*, and thus somewhat misleads Fernald, who quotes him in opposition to Lintner.

S. plebeius Fabr., Sp. Ins. ii, 146, *Sphinx;* Gen. Ins. 273; Mant., Ins. 95, *Sphinx;* Philos. Ent. 273; Ent. Syst. iii, 1, 367, *Sphinx;* Steph., Ill. Br. Ent. Haust. i, 122, *Sphinx;* Harr., Sill. Journ. 36. 296, *Sphinx;* Wood, Ind. Ent. 246, pl. 53, fig. 27, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 224, *Anceryx;* Clem., Journ. Ac. N. Sci. Phil. iv. 170, *Sphinx;* Morris, Syn. 1862, 195, *Sphinx;* G. & R., Pr. E. S. Phil. v. 166, *Hyloicus;* Scud.,* Psyche ii, 78, *Sphinx;* Bd.,* Sp. Gen. Het. i. 99, *Sphinx;* pl. i, fig. 3, larva; Butl., Tr. Zool. Soc. Lond. ix. 617, *Hyloicus;* Fernald,* Sph. N. E. 52, *Hyloicus;* Grt., Hawk Moths 41, *Atreus.*

Head, thorax and abdomen dark gray. The palpi are whitish beneath and have a brown stripe across the outside, which extends back including the eyes, under the wings. The collar is edged behind with black, and a black stripe extends through the middle of the patagiæ, below which the side of the thorax is paler. The abdomen has a central dark line and a broad band of the same color enclosing a row of four or five whitish spots along each side. The under side is pale yellowish or sordid white. Primaries gray, with a white discal spot encircled with black, and there are heavy black dashes between the veins from the base along below the median vein to the apex. The usual cross lines on the basal part of the wing appears as a pair of oblique faint brown stripes from the basal fourth of the costa to the discal cell, and there are three very indefinite brown lines across the outer part of the wing, dentate on the veins. The fringes are alternately white and brown, the latter color resting at the ends of the veins, which are also marked with brown at their extremities. The hind wings are dark blackish brown, grayish towards the base and on the anal angle. Fringes alternately brown and white. The under side of the fore wings is ashy brown with a darker, dentate line across the outer part. The under side of the hind wings is paler than that of the fore wings, but has a dark gray terminal band and dentate line continuous with that on the fore wings; sometimes there is a second line crossing the middle of the wing. Expands 2.65—3 in.; 66—75 mm.

Hab.—Canada to Florida; westward to the Mississippi.

This is an extremely well marked species. The dark unbanded secondaries, ashy gray primaries with heavy longitudinal dashes and white discal spot are distinctive. The tibiæ are not spinose, except a few on anterior pair; first joint of fore tarsi with a series of three or four outer, long, curved spines. The spurs of middle and posterior tibiæ are very long and unequal. The genitalia are of the usual type. The supra-anal hook is somewhat compressed laterally, the inferior projection short. The clasper is stout and corneous, and somewhat excavated.

The genus *Atreus* Grt., based on this species has absolutely no foundation. The larva has been quite well described by Scudder, and Boisduval gives a description after a figure by Abbot.

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S. cupressi Bd., Sp. Gen. Lep. Het. i, 102, pl. 2, figs. 3-5, *Sphinx;* Hy. Edw., Can. Ent. xix. p.

It has the size and habitus of *juniperi*, but the primaries are a little more elongate and a little more pointed; they are of ashy white, just as in *juniperi*, striate with brown, principally towards the base and the internal angle; the apex is marked, as in related species with an oblique brown mark. The discal mark is small and not easily visible. The secondaries are of a somewhat reddish brown, with the base paler. The thorax is pale gray with the tegulæ reddish, bordered with white at the base of the wings. The abdomen is brown, a little reddish, very like the secondaries, with a dorsal black line which dilates at the incisures and forms spots on the posterior segments. The sides are marked by a series of black spots separated by the incisures. Beneath, brownish gray with a badly defined brown transverse band. Expands 3 inches; 75 mm.

Hab.—Georgia (Abbot).

The foregoing is a close translation of Boisduval's description of this species which was not until very recently known to American collectors. The figure shows a brownish gray species with a series of four longitudinal brown stripes at base, the upper extending through cell and almost to the apex, twice interrupted in its course; two parallel oblique lines toward internal angle, and the oblique apical dash. The abdomen shows three triangular spots on the hind margins of segments 4, 5 and 6. Head small, front pointed, antennæ short and slender; outer margin of primaries scalloped. Secondaries with margins even, fringes white, cut with brown.

Recently this species has been taken in Florida, and I have seen a somewhat imperfect specimen. The antennæ of the ♂ is stout and quite strongly ciliated. The tibiæ are not spinose, but the fore tarsi have the basal joint armed outwardly with long spines. The spurs of middle and hind tibiæ are very long. At first sight the species resembles *Ellema* quite strongly. It is a very distinct species. In the specimen seen the lateral black spots mentioned by Boisduval are wanting. It contained only a dorsal and subdorsal line. Boisduval describes the larva after a colored drawing by Abbot.

DOLBA Wlk.

Cat. Lep. B. M. Het. viii. 229,

Head small, roughly scaled, forming an indefinite truncate frontal tuft. Eyes small, round, distinctly lashed. Palpi short, straight, hardly exceeding front, roughly scaled. Tongue as long as the body. Antennæ fusiform, with a short abrupt hook at tip. Thorax short, stout, but little advanced in front of the primaries with short, stout, erect, metathoracic tufts. Abdomen conic, untufted, the hinder edges

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of segments spinulose. Tibiæ not spinulose, median with one pair, posterior with two pairs of moderately long unequal spurs; legs moderate, but little longer posteriorly. Primaries eleven veined, venation as usual, outer margin entire, but for a slight excavation above anal angle. Secondaries slightly produced at anal angle. The genitalia of the single species offer no great peculiarities; the supra-anal hook is rather long, somewhat irregular and with a darker bent tip; the inferior process but little exceeding half the length of the other. The side pieces are long, rather narrow, somewhat curved, the tip rounded; the clasper is a stout rolled plate, extended into a rather short, thick spur or process.

There is but a single species, differing from *Chlænogramma*, the genus with which it most nearly agrees in structure, by the lashed eyes, the smaller head, comparatively stouter body and shorter wings. From all the other forms with lashed eyes it differs by the non-spinose tibiæ. The dark coloration and small size of the single species renders it easily recognizable.

D. hylæus Dru., Ex. ii, 45, pl. 26, fig. 3, *Sphinx;* Cram., Ex. ii, 16, pl. 107, fig. C. *Sphinx;* Fabr., Sp. Ins. ii, 149, *Sphinx;* Mant., Ins. ii, 97, *Sphinx;* Ent. Syst. iii, 1, 373, *Sphinx:* Gmel., ed. Linn. S. N. 2383, *Sphinx;* Hüb., Verz. 139, *Hyloicus;* Westw., ed. Dru. ii, 49, pl. 26, fig. 3, *Sphinx;* Harr.,* Sill. Journ. 36, 296, *Sphinx;* Wlk., C. B. M. Lep. Het. viii, 230, *Dolba;* Clem.,* Journ. Ac. N. Sci. Phil. iv, 1859, 178, *Dolba;* Morris,* Synopsis 1862, 203, *Dolba;* Harris,* Inj. Ins. Flint ed. 328, *Sphinx;* Grt., Buff. Bull. i, 26, *Dolba;* Scud.,* Psyche, ii, 77; Bd.,* Sp. Gen. Lep. Het. i, 98, *Sphinx;* Butler, Tr. Zool. Soc. Lond. ix, 612, *Dolba;* Pilate,* Pap. ii, 66; Harrington, Can. Ent. xvi, 54; Fernald,* Sphing. 48, *Dolba;* Holland,* Can. Ent. xviii, 103, *Dolba;* Grt., Hawk Moths 39, *Dolba.*

prini A & S.,* Ins. Ga. i, p. 69, pl. 35, *Sphinx;* Westw., ed. Dru. ii, 47, pr. syn.

Upper side of body and primaries varying from rusty red brown to blackish. Palpi whitish beneath. Thorax white laterally, and with two white dorsal spots, often wanting; the metathoracic tufts black. Abdomen with an interrupted dorsal line, a row of white on each side of middle, and a darker lateral band, all the segments margined with white. The under side of thorax and abdomen is white. Primaries with a white patch at base and a white discal dot. A series of three black dentate transverse lines at basal third, the inner lines accompanied by white shades. Another series of three similar lines at outer third; the inner line darkest, heaviest and most dentate, the outer line more or less white powdered, and beyond this the wing is usually more or less blotchy and white marked. A rather evenly sinuate series of somewhat lunate spots, the lunules convex inwardly between this last series of lines and the outer margin, and a similar but less complete row of marginal lunules, convex outwardly. A subapical streak surmounted by an apical white shade. Secondaries smoky brown to blackish, with whitish at base, and a whitish shade accompanying the dentate

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median lines. Anal angle powdered with white. Fringes of both wings cut with white and brown. Beneath primaries mouse or dark ash gray, with the outer series of transverse lines faintly reproduced; secondaries paler, powdered with whitish to the dark outer margin, crossed by three dentate black lines, which are often more or less confluent. Expands 2—2.50 inches; 50—62 mm.

Hab.—Canada to Alabama; westward to Missouri, Iowa.

This species varies greatly in ground color and much in distinctness of maculation. Some specimens are nearly black, and in these the maculation is very indistinct, sometimes only indicated by the white scales, which in such specimens are prominent. In other pale specimens the black transverse lining is very distinct, and the specimen has somewhat the appearance of a miniature *S. rustica* with the white omitted. It is rather common. Smith and Abbot first figured the larva on ink berry (*Ilex glabra*) and until the present time no one has written the life history of the species.

CHLÆNOGRAMMA Smith.

Ent. Amer. iii, p. 154.

Form rather robust, yet graceful. Head small, retracted, though scarcely sunken. Eyes not lashed. Palpi stout, scarcely attaining front; antennæ fusiform, the tip hardly recurved; a small tuft between the antennæ; tongue moderate. Thorax rather short, stout, not produced before base of primaries, as usual with indefinite posterior tufts. Abdomen long, conic, pointed, with small, loose dorsal tufts. Legs rather short and not very strong, subequal, tibiæ not spinose, anterior tarsi not armed in any way. Primaries large, rather broad, outer margin even or very faintly scalloped, somewhat excavated above the hind angle. Secondaries of the usual form, venation as usual.

The only species referred here is the *Diludia jasminearum* of our lists.

The genus *Diludia* was created by Messrs. Grote and Robinson in 1865, with *Sphinx brontes* as type, and with it were associated *florestan* and *collaris*, all West Indian or South American species (see Proc. Ent. Soc. Phil. 1865, pp. 163 and 188). In describing the genus they say that *Sphinx jasminearum* and *S. leucophœata* would probably be referable to the same genus when identified.

Three species of *Diludia* accordingly appear in our lists: *jasminearum* Bdv., *brontes* Dru. and *leucophœata* Clem.

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As characterized by the describers, *Diludia* is said to have the "head large and salient; prothoracic parts well advanced before the insertion of primaries." In the figure of *D. brontes* given by them (l. c. pl. 1, fig. 5) these characters are well marked, and with the genus *Diludia* as based upon this species I have no present disagreement.

In describing the species originally, Drury records it from New York, and for some time the name was applied to what we now know as *C. undulosa*. Mr. Grote, however, showed that it could not well be this species, and thinks Drury mistook the locality of the specimen. He figures a Cuban form which he identifies as *brontes*, yet names *cubensis* in case he should be in error.

Mr. Butler agrees with Mr. Grote in the identification of the species, and thinks the name *cubensis* unnecessary. Boisduval, on the contrary, still believes *undulosa* to be the form intended by Drury, and so cites his figure; he adds that it is poor, and had Drury not been explicit in stating that his specimen came from New York, he would not have dared to identify it with *undulosa;* but he believes Drury intended this species, and not the one figured by Mr. Grote, and will continue so to believe until some species from New York turns up which agrees better with Drury's picture.

After a careful study of specimens and figures I believe Mr. Grote correct, and exclude *brontes* from our fauna as West Indian since I know of no records sufficient to authorize its reception into our faunal lists.* On comparison with *jasminearum* I find *brontes* to differ generically in the head and thoracic structure. It agrees with the characters given by Grote & Robinson above cited, and disagrees with those above given by me for *Chlænogramma*. The legs are unarmed, but the fore tarsi are heavily spinulose. The species belongs with *rustica* and allies, or with *Pseudosphinx*.

Of *leucophæata* I have seen several specimens from Mexico, which also are not congeneric with *jasminearum*, nor indeed with *brontes*, but closely allied to *lugens* in all essentials. The eyes are lashed, the fore tibiæ spinose, the tarsi with longer outer spines as in *lugens*. Compared with the latter species the primaries are narrower and longer, with more pointed apices. The transverse maculation is much less distinct. I have no doubt of the correctness of the determination of the specimens examined, which I believe was made

* Mr. Edwards has since published a record of its capture at Indian River, Fla. See on this point appendix hereto.

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by Mr. Grote. I believe also that Clemens' locality was erroneous, or that the species is but a visitor, as is *S. tetrio* and some others.

The result of this is that the genus *Diludia* loses two of the species referred to it, and disappears from our faunal lists, leaving *jasminearum* as the representative of a distinct generic type.

C. jasminearum Bd., Griffiths Cuvier An. Kingd. ii. pl. 84, fig. 1, *Sphinx;* Wilson's Treat. Ent. Enc. Brit. pl. 236, figs. 5 and 6, *Sphinx;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 173, *Sphinx;* Morris,* Synopsis Lep. 1862, 198, *Sphinx:* Wlk., C. Brit. Mus. Suppl. 31, p. 36, *Sphinx;* G. & R., Pr. E. S. Ph. v. 165, *Sphinx;* List. Lep. 1868, p. 4, *Diludia;* Bd., Sp. Gen. Lep. Het. i, 114, *Sphinx;* Grt., Buff. Bull. i, 25, *Diludia;* id. ii, 227, *Diludia;* Strk.,* Lep. Rhop. et Het. 115, pl. 13, fig. 14, *Sphinx;* Butler, Trans. Zool. Soc. Lond. ix. 618, *Sphinx;* id. 640, *Diludia;* Grt., Hawk Moths 39, *Diludia.*

Head and thorax pale ashy gray, with a transverse line on prothorax extended through the middle of tegulæ and over the metathoracic tufts, completing the ring, sometimes the dorsum of thorax has an indefinite line each side of the middle. Abdomen dull gray, with a darker, narrow dorsal line and a broad lateral band containing large round pale spots, often interrupting the band. Primaries pale ashen gray with blackish brown markings. A blackish streak from base, along inner margin; two very irregular, dentate, transverse lines about one-third from base, not very distinct. Beyond the middle a series of three much more distinct scalloped lines straight from costa to middle, then inwardly curved. Beyond this is another lunulated and more or less interrupted line, not so distinct as those before described. From the basal bands on costa a blackish shade band extends obliquely across the wing to the middle of the outer margin, and below this from the basal transverse lines extends a short spur of the same color. An irregular, subapical black streak. Discal spot white, small; beyond it an irregular yellowish brown blotch. Fringes white, cut with black. Secondaries black, with a faint grayish central band, and the outer margin grayish powdered, wider toward anal angle. Beneath, nearly uniform dull fuscous with two common, darker, central bands. Expands 4—4.25 inches; 100–105 mm.

Hab.—New York, New Jersey, Pennsylvania, Maine, Canada, Maryland, Georgia.

The genitalia are, in the supra-anal plate, after the general type. The side piece is broad, the clasper large, broad, ladle shaped, abruptly bent beyond its base, the terminal margin serrate and dentate.

The species is rare, and apparently not very widely distributed. My list gives Canada and Maine as localities without authority. Prof. Fernald omitted the species because not certainly recorded from New England.

There is no difficulty in recognizing the species. Superficially it resembles *Ceratomia*, but is readily distinguished by the oblique black shade band heretofore mentioned.

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The early stages have been mentioned, but scarcely well described, by several authors. The species has been raised several times to my knowledge, and a good description ought not to be long among the desiderata. It has been figured by Boisduval, and shortly described by Clemens and Strecker.

CERATOMIA Harr.

Sill. Journ. 36, 286–293.

Head small, retracted, with a slight interantennal tuft; antennæ subfusiform, the hook distinct, long, but not abrupt. Palpi small, slender, hardly reaching the middle of front, the vestiture not heavy. Eyes small, not perceptibly fringed, not at all prominent. Tongue reaching about the end of thorax, not very strong. Thorax short, but little advanced before the base of the wings with short, stout, post-thoracic tufts and scale ridges along inner edge of patagiæ. Abdomen cylindrical, tapering to the tip, untufted, the segments posteriorly spinulose. The legs are short, weak, subequal, spurs of middle and posterior tibiæ small. Tibiæ not spinose, except that the fore tibia has usually some short, stout terminal spinules; first joint of anterior tarsi with three stout outer claw-like spines and a smaller spine at tip of second joint.

The primaries large, with eleven or twelve veins; the number being variable in the same species, outer margin oblique, entire, or with a slight excavation at the end of vein two. Secondaries with outer margin entire, except a slight rounding out on the end of vein 1b. The genitalia are variable, that of *amyntor* having the supra-anal plate produced into a broad, somewhat irregular, pointed hook, the inferior projection reduced to two points; the clasper is also unique and will be further described hereafter. In the other species the supra-anal plate is more laterally compressed, the upper hook short and not curved, the lower much narrower, upcurved at tip, altogether more *Sphingiform*, as is also the clasper.

To the single species usually placed in this genus I add the species usually classed as *Daremma*. The only difference that can be discovered in the imagos excluding the genital characters are, that in *amyntor* the primaries are very slightly excavated above the anal angle, while in the others this character is not so noticeable in the majority of specimens, though it is easy with series of each species at command to find specimens of *hageni* and *undulosa* that will

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match specimens of *amyntor* in this respect. The difference in genital structure is more marked, but I am not ready to base genera on this character as yet.

In the larval state the species are yet more dissimilar; that of *amyntor* has the peculiarly horned thorax; those of *hageni* and *undulosa* are laterally marked with oblique stripes, and are distinctly sphingiform, while *catalpæ* has a cylindrical larva which is striped and more or less spotted.

In the imago state the species are as easily separable. *Amyntor* is larger in size as a rule than the other species, though extremely variable in this respect; the head and collar are white, and this gives the insect a rather peculiar appearance, different from that of the other species; the costal region of primaries is pale luteous brown, while the transverse maculation, except near the outer margin is obsolete.

Undulosa differs at once in the concolorous head and collar, the uniformly gray primaries on which the transverse maculation is very distinct. It is a smaller species in average expanse than *amyntor*.

Hageni is usually still smaller, the maculation very much as in *undulosa*, while there is an olive green shade over the whole wing which is distinctive.

Catalpæ is a darker, much more obscurely marked species, about the size of *hageni*, without trace of green and with the transverse markings obscure and partly obsolete.

In synoptic form the species are separable as follows:

Head and collar discolorous white.
  Costal region pale luteous brown; transverse maculation indistinct.
    amyntor.

Head and collar concolorous.
  Transverse maculation distinct.
    Primaries even gray without green.....**undulosa.**
    Primaries suffused with green.....**hageni.**
  Transverse maculation obscured, general color grayish fuscous.....**catalpæ.**

C. amyntor Hüb., Samml. Ex. Schmett. ii. *Agrius;* Wlk., C. B. M. Lep. Het. viii. 251; G. & R., Pr. Ent. Soc. Phil. v. 164-190, *Ceratomia;* Beth.,* Can. Ent. i. 171, *Ceratomia;* Minot.,* Can. Ent. ii. 28; Bd.,* Sp. Gen. Het. i. 53, pl. 1, fig. 2, *Ceratomia;* Butl., Tr. Zool. Soc. Lond. ix. 621, *Ceratomia;* Pilate,* Pap. ii. 66; Fernald,* Sphing. 24, *Ceratomia:* Grt., Hawk Moths 38, *Ceratomia.*

quadricornis Harr.,* Sill. Journ. 36, 293, *Ceratomia:* Wlk., C. B. M. Lep. Het. viii. 258, *Ceratomia;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 179, *Ceratomia;* Morris,* Syn. 1862. 205, *Ceratomia;* Harr.,* Inj. Ins. Flint ed. 323, figs.

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148, 149, *Ceratomia;* Lint.,* Pr. E. S. Phil. i. 286, life history; id. iii. 664, pupa; G. & R., Pr. Ent. Soc. Phil. v. 164, pr. syn.; Andrews,* Can. Ent. viii. 40; Bd.,* Sp. Gen. Lep. Het. i. 53, pr. syn.; Hagen, Pap. iii. 61.

Palpi, under side of head, and all the legs dark coffee brown; upper side of the head, thorax and collar whitish, the head and collar more or less stained with clay color and edged with brown. Upper side of thorax luteous, the patagiæ edged with dark brown, and another line of dark brown follows the upper edge of the white on the sides. The lateral thoracic tufts at the posterior part of the thorax are marked with luteous, dark brown and white. The abdomen above and beneath is clay colored, with a narrow black dorsal line more or less interrupted at the incisures, and two broader and less definite lateral brown lines. Primaries with costa light brownish gray, and a stripe of luteous extends from the base of the wing along the cell, widening outwardly to the apex. The central part of the wing below the cell and between the inner and outer cross lines is dark coffee brown. The discal spot is small and white, and there are several heavy black dashes between the veins and parallel with them below the median and beyond the cell, forming an oblique series from apex to the base. A triple dark brown line starts from the costa near the base and runs very obliquely towards the end of the cell, giving off one tooth in its course, then turning sharply back, runs to the hinder margin near the base of the wing in a somewhat wavy course. This line is usually very indefinite, and rarely distinct enough to be traced for its entire extent. A similar triple line, more separated on the costa, starts from the outer fourth and runs down as far as vein 5 at nearly right angles to the costa, thence obliquely and parallel, to the hinder margin. This line is several times angulated in the first part of its course, then wavy to near the hind margin, where it forms a sharp outward angle. The outer one of the lines is margined outwardly with grayish. This line is very indistinct through the costal region, and below this the outer line is much the most distinct. Secondaries dull fusco-luteous, with a central fuscous band, the margins only distinct, forming rather two parallel lines with a dusky shade between and a broader indefinite subterminal band; grayish near anal angle. Beneath pale, brownish gray, lighter on the costal margins. Primaries with the transverse maculation more faintly reproduced. Secondaries with three brown discal lines giving off sharp angles on the veins. Expands 3—4.25 inches; 75—106 mm.

Hab.—Canada to Virginia; westward to Missouri, Iowa.

The species is not very variable, and is easily recognized. It has a very distinctive appearance, given by its coloration rather than by any structural feature, and the species has always been separated from *Sphinx*, principally however, upon its larval history. This is certainly aberrant for the family, and Walsh, many years ago, saw in the resemblance of the larva to that of some of the *Ceratocampidæ* an affinity between the families. This affinity, which seems to me really non-existent, for there is nothing in the imago to bear it out, has been enlarged upon without being added to by Mr. Grote, who has evidently forgotten where he first got the idea since he never credited it to its first propounder.

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This species is not rare. The genitalia of the male are rather distinctive. The supra-anal plate has been already described; the side pieces are oblong, with the tip obliquely rounded, the clasper short, broad, concave, the tip oblique, straight, the margin serrate as is also the outer portion of the superior margin.

The life history of the species was first written in a general way by Harris, and since his time the species and its abnormal larva have been very generally referred to in accounts of the family.

C. undulosa Wlk., C. B. M. Lep. Het. viii. 231, *Daremma;* Clem., Journ. Ac. N. Sci. Phil. iv. 186, *Daremma;* Morr., Syn. 1862, 214, *Daremma;* Lint.,* Ent. Cont. ii. 128, *Daremma;* Andrews,* Psyche ii. 73; Hulst.,* Bkln. Bull. ii. 35; Butl., Tr. Zool. Soc. Lond. ix. 611, *Daremma;* Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 65, an sp. dist. *brontes* Dru.? Fernald,* Sphing. 27, *Daremma;* Holland,* Can. Ent. xviii. 102; Grote, Hawk Moths 38, *Daremma.*

brontes ‡ Bd., Sp. Gen. Lep. Het. pl. 15, fig. 6; id. i. 116, *Sphinx;* Grt., Pr. E. S. Phil. v. 39 = *repentinus;* G. & R., Tr. A. E. S. ii. 76, pr. syn.

repentinus Clem., Journ. Ac. N. Sci. Phil. iv. 1859, 180, *Ceratomia;* Morris, Syn. 1862, 206, *Ceratomia;* Grt., Pr. Ent. Soc. Phil. v. 39, *Ceratomia;* id. 72, *Sphinx;* G. & R., Pr. E. S. Phil. v. 164, 189, *Daremma;* Tr. A. E. Soc. ii. 76, pr. syn.; Beth., Can. Ent. i. 17.

Head and palpi brownish gray, the latter being darker on the middle joint, and the head darker above, and lighter on the sides. The thorax is gray, with two black lines edged with yellowish, crossing the prothorax. These lines meet two similar ones on each side, which run backwards, one on each side of the patagiæ and meeting behind where the patagiæ are tipped with white. There is also a curved black line preceded by white and followed by yellowish across the hinder part of the thorax. The abdomen is gray, with a dark brown dorsal line, a broad, broken, subdorsal line, and a narrower lateral brown line; the edges of the segments paler. The whole under side is gray, with the breast of a pale, coffee brown color. Primaries gray, mixed with yellowish scales, and crossed by four pairs of wavy or angulated dark brown lines, which start from the costa at unequal distances apart and divide it into five very unequal parts. The pair nearest to base of the costa runs obliquely as far as the cell, giving off one tooth, then it takes a somewhat wavy course to the hinder margin nearly at right angles with it; often it is obsolete below the cell or only marked as a shade. The second pair crosses the wing within the discal spot, curving outwardly to the cell, then inwardly more gently to the inner margin; the lines are feebly toothed at about the middle, and sometimes rather indefinite below the cell. The third pair starts at right angles with the costa, and curving around the end of the cell ends near the middle of the hind margin. The inner of these two lines is slightly angulated, while the outer one gives off quite long and sharp teeth, and the space between them is filled in somewhat with ochre yellow scales. Between this and the outer pair of lines the space is filled in somewhat with whitish. The outer pair of lines starts at right angles with the costa, curves evenly around to vein 2, and then runs with a slight curve to the inner margin. The outer one

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of this pair is scarcely undulated or toothed, while the inner one gives off acute angles on each vein. A black shade line starting from the apex obliquely, extends into the third pair of cross lines. A parallel dash crosses the outer pair just below, and there are two and sometimes three parallel black dashes near the middle of the wing extending from the median vein out to the outer pair of lines between the veins. The fringes are white, marked on the veins with dark brown spots, from which brown dashes extend nearly half way across the terminal space. Secondaries dark smoky brown, lighter on the hinder margin, and crossed by three parallel darker brown wavy lines, the outer rather a broad, but indistinctly limited band. The fringes are white and marked with brown on the veins. The under side of the wings is gray. The primaries are crossed outwardly by a dentate line and the oblique apical line is partly reproduced. The secondaries are somewhat lighter and are crossed by two dentate yellowish brown lines, one a little before the middle, the other a little beyond. Expands 3--3.75 inches; 75--94 mm.

Hab.—Canada to Virginia; westward to Illinois, Missouri, Iowa.

This species is not uncommon. It varies somewhat in the depth of ground color and the distinctness of the lines, but in no other important point so far as I am aware.

The supra-anal piece has been already described. The side piece is moderately long and narrows evenly to a pointed tip. The clasper is a broad, corneous plate, somewhat curved, and the lower angle drawn out into a long acute point. The life history is tolerably well made out by Andrews, Fernald and Lintner.

C. hageni Grote, Buff. Bull. ii. 149, *Ceratomia;* Butl., Tr. Zool. Soc. Lond. ix. 621, *Ceratomia;* Strk., Lep. Rhop. et Het. 127, pl. xiv, fig 6, *Sphinx;* Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 66, *Daremma;* Riley,* Rep. U. S. Dept. Agric. 1881-82, p. 193, pl. xii, fig. 2, *Sphinx.*

Gray and olivaceous, the latter of a variably intense hue, but always distinct, sometimes nearly blackish; variable also in distribution, sometimes tolerably even over the entire wing, more usually most prominent at base, terminally and exteriorly between the double dentate black transverse lines which cross the wing somewhat as in *D. undulosa.* On the whitish discal blotch is a small ringed white spot, and a smaller dot is placed above this and obliquely outwardly at the origin of vein six. A white apical shade limited inferiorly by an oblique black zigzag streak. As in *Ceratomia amyntor* there are black dashes on the interspaces running obliquely inwardly, but these are less prominent and diffuse than in Hübner's species. Fringes olivaceous, narrowly interrupted centrally with white. Hind wings blackish, with double faint transverse shade lines, and with the external margin olivaceous. A fine terminal dark line, fringes as on the primaries. Beneath fuscous gray, with double, transverse exterior common dentate line, and on primaries the apical streak repeated. Tegulæ olivaceous; disc gray. Abdomen dorsally olivaceous, laterally gray, with a dorsal black line; two lateral stripes and a stigmatal line on each side. Head above and collar olivaceous, the latter with two black lines and the tegulæ are lined; sides of thorax and collar whitish. Antennæ white outwardly. Expands 3.75--4.10 inches; 94--102 mm.

Hab.—Texas.

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The species is readily recognized. It is intermediate between *undulosa* and *catalpæ* in size, with the same typical maculation, distinct enough from each at first sight by the green or olivaceous powdering of the primaries.

The variation is in the intensity of coloring; sometimes the primaries will be very dark, leaving only the outer margin beyond the transverse lines paler. Prof. Riley has figured the extreme of this variation as well as the more common form and the larva, in the Rept. U. S. Agricultural Department for 1881–82. The genitalia are much as in *undulosa*. I could not make a very close study of them.

D. catalpæ Bd.,* Sp. Gen. Lep. Het. i. 103, pl. ii, figs. 1 and 2, *Sphinx;* Strk., Lep. Rhop. et Het. 142. *Sphinx;* Grt., Buff. Bull. iii. 224, *Diludia;* Koebele,* Bklu. Bull. iv. 20; Grt., Can. Ent. x. 231, *Daremma;* Butl., Tr. Zool. Soc. Lond. ix. 629, *Pseudosphinx;* Riley,* U. S. Agr. Rep. 1881-82, 189, pl. xiii. life history.

Ashy or fuscous gray, more sordid in appearance than either of its congeners, with essentially the same markings, but much less distinct. Head and sides of tegulæ paler, more grayish, collar with two transverse black lines joined at the extremes. Tegulæ darker to the lateral pale shade, a distinct brown line separating the two shades; the terminal tuftings are blackish, dorsum of thorax of the ground color. Abdomen of the same sordid fuscous gray with a more or less evident dorsal line and a broader, interrupted, subdorsal line and a narrow lateral one. Beneath uniform pale fuscous gray. Primaries with an obscure, transverse shade at basal fourth, outwardly angulated over the cell, and inwardly terminating on the inner margin rather close to base. Beyond the discal spot is another dusky shade somewhat lunulate, more distinct than the others, evenly curved outwardly over the cell and thence rather straight to inner margin a little beyond the middle. Beyond this line, to the outer of the following lines, the wing is usually somewhat lighter in shade. From the outer fifth of costa a double line runs, outwardly curved to middle, then parallel with outer margin, to the hind margin rather close to the anal angle. The two parts of this double line are rather remote at costa, the outer forming an obscure blotch. An oblique angular black streak from apex inwardly, a longitudinal black streak between veins 5 and 6, and another in the submedian interspace near the base. Discal dot distinct, round, pale, dark ringed. Fringes paler gray, cut with dark brown. Secondaries deep fuscous brown, with three indefinite darker transverse bands, the two median converging at anal angle. Fringes as in primaries. Beneath much the same color as above, but a somewhat paler shade, the transverse shadings of both wings faintly reproduced. Expands 2.75—3.50 in.; 70—87 mm.

Hab.—Virginia to Florida; westward to the Mississippi; as far north as Indiana.

The species varies somewhat in intensity of markings, but never becomes distinctly ornamented. Boisduval figures a form with much

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greenish suffusion, but this seems rare. Prof. Riley's figure is a good representation of the more common form.

Despite the abundance of the larva the moth is not common in collections. The genitalia are distinctive. The supra-anal plate is much compressed laterally forming a long, curved, pointed hook; the inferior process is short, broader than the superior, and upcurved. It is really not unlike that of *undulosa*, but the superior hook is longer and more compressed laterally. The side piece is very much like that of *undulosa* in shape, but the clasper is a broad, somewhat ladle-shaped process, with the oblique outer margin irregularly dentate.

The larva has been described by Koebele, Boisduval and Riley, the latter giving the complete unique life history illustrated by good figures.

ELLEMA Clem.

Journ. Ac. N. Sci. iv. 1859, 187.

Head small, retracted, the vestiture forming a somewhat indistinct tuft between the antennæ; palpi short and slender; tongue membranous, about equal in length to the palpi; practically obsolete. Eyes of medium size and scarcely lashed. Antennæ slender, fusiform, rather largest beyond the middle, ending in a somewhat bent ciliated seta, simple in the females, biciliate in the males. Thorax very short and stout, rounded in front, and scarcely advanced in front of the base of primaries; the vestiture thin, but close. Abdomen cylindrical and tapering, untufted; the hinder edges of the segments spinulose. Fore and middle tibia spinulose; middle and hind tibiæ with the usual spurs short; legs subequal, not strong. Primaries eleven veined, moderate, with an even obliquely rounded outer margin. Secondaries with the usual venation, outer margin entire, somewhat excavated between veins 1b and 2.

The species are rare, and I have been able to dissect *harrisii* only. In this the supra-anal plate of the ♂ is very like that of the genus *Darapsa*, the side piece is moderate, with the tip oblique. The clasper is broad and corneous, and can be compared to nothing better than a gouge chisel.

There are four American species described; all of them are pine feeders, and except *harrisii* they are all very rare; even *harrisii* is not often obtained unless bred from the larva. The species are closely allied, of a cinereous color, more or less shot with umber brown; the maculation, except in *harrisii*, indefinite.

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Harrisii, as stated, has the maculation most distinct; the thorax has a dark line each side of the disc, and the abdomen has a lateral dusky line. The primaries have the transverse lines very distinct; the t. a. lines are angulated over the cell, while the t. p. lines are strongly dentated on the veins.

Bombycoides is closely allied; the color is more shot with umber brown, the markings very much as in *harrisii*, but much more obscure, and the basal transverse bands are wanting.

Coniferarum lacks the maculation on thorax and abdomen, and the transverse maculation is reduced to a faint reproduction of the outer line so prominent in *harrisii*.

Pineum still more resembles the *Ptilodontids* in wing form; the uniform color, darker than *harrisii*, with only a darker, indefinite, curved shade to represent the t. p. lines will easily distinguish this species. The larvæ lack the caudal horn.

The present position of this genus, at the end of the Sphingid series is contrary to my previously expressed opinion, placing it with the *Smerinthids*. A more careful study of all the features of the genus convinces me that it is rather a lead from the *Sphinginæ* to the *Ptilodontids*, i. e. that the *Sphingidæ* have decided affinities with two distinct Bombycid families; i. e. with *Saturnia* through *Cressonia*, and with *Heterocampa* through *Ellema* and *Exedrium*. The general habitus of the species is a degraded *Hyloicus* type, while the wing form, the structure of the tibiæ and of the genitalia all are *Sphingid* rather than *Smerinthid*.

The larva, too, have nothing of the *Smerinthid* type, while resembling in some respects, at least, the *Sphinginæ*.

E. harrisii Clem.,* Journ. Ac. N. Sci. Phil. iv. 188, *Ellema;* Morr., Syn. 1862, 216, *Ellema;* Lint.,* Pr. E. S. Phil. iii. 669, *Ellema;* G. & R., Pr. E. S. Phil. v. 166, *Ellema;* Beth.,* Can. Ent. i. 18, *Ellema;* G. & R., List. Lep. 5, *Hyloicus;* Wlk., C. B. Mus. Lep. Supp. 36, 297, *Ellema:* Lint.,* 23, Rep. N. Y. State Cab. N. H. 170. pl. 8, figs. 10 and 11, *Ellema;* Ent.,* Cout. i. 38, *Ellema;* Grt., Buff. Bull. i. 27, *Ellema;* Andrews,* Psyche ii. 79; Grt., Tr. A. E. S. ii. 115, *Hyloicus;* Grt., Buff. Bull. ii. 228, = *bombycoides;* Bd.,* Sp. Gen. Lep. Het. i. 106, *Sphinx;* Strk., Lep. Rhop. et Het. 116, pl. 13, fig. 16, *Lapara;* Butl., Tr. Zool. Soc. Lond. ix. 626, *Ellema;* id. 642, *Hyloicus;* Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 66 = *bombycoides;* Fernald,* Sphing. 83, var. *bombycoides*, *Ellema*.

coniferarum ‡ Harr., Sill. Journ, 36, 297, *Sphinx;* Wlk., C. B. M. Lep. Het. viii. 224, *Anceryx;* Clem., Journ. Ac. N. Sci. Phil. iv. 188, sp. err. cit.; Harris, Inj. Ins. Flint ed. 328, *Sphinx*.

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Head, palpi and thorax umber brown, disc irrorate with white, patagiæ also white tipped and with a deeper brown line margining the discal space at sides; the line variably distinct, but traceable in all specimens seen by me. Abdomen umber brown with indistinct lateral deeper brown lines. Primaries umber brown, with whitish scales scattered over the surface; a pair of deep brown transverse lines angulated over the cell, and another pair of more distinct, strongly dentate darker outer lines. The first line starts from basal fifth of costa, the second from basal fourth. These two lines extend obliquely out, the second one to the dark discal dot, then turning they run to the hinder margin near the base, where they are lost in an indistinct reddish brown spot. The third line starts from costa a little beyond the middle, curves outward around the cell, and ends near the middle of the hinder margin. This line is sharply toothed on each vein. The outer line, which is darkest and is followed on its outer side by a narrow, brown shade, starts from the outer fourth of costa and crosses the wing parallel to the last, and equally dentate on the veins. The space between these two lines is more heavily overlaid with white scales than any other part of the wing. Two black dashes rest on the wing, one between veins 2 and 3, and the other between veins 3 and 4, and extend from the median vein to the outer line. A row of terminal black venular spots. Sometimes the space beyond the outer dentate line, nearly to the margin, is umber brown, a paler transverse line running along the outer dents of the dark line. Fringes brown, cut with white. Secondaries umber brown, lighter at the base, and sometimes with a faint trace of a median band. The fringes are marked alternately with white and brown. The under side of all the wings is grayish brown, with a darker colored line, scarcely visible, crossing the outer part. Fringes as on the upper side. Expands 2--2.50 inches; 50—63 mm.

Hab.—Canada to Florida; westward to the Mississippi.

The species is tolerably widely distributed, but hardly common anywhere. It varies much in the depth of ground color, and in the distinctness of maculation; all the lines, however, being at all times traceable. The larva has been best described by Lintner.

E. bombycoides Wlk., C. Lep. B. Mus. Het. viii. 233, *Lapara;* Clem., Journ. Ac. N. Sci. Phil. iv. 187, *Lapara;* Morr., Syn. 1862, 215, *Lapara;* Grt., Buff. Bull. i. 292, *Lapara;* id. ii. 228; Bd. Sp. Gen. Lep. Het. i. 292, *Lapara;* Strk., Lep. Rhop. et Het. 116-127, pl. 14, fig. 7, *Sphinx;* Grt., Buff. Bull. iii. 225, *Ellema;* Lint., Ent. Cont. i. 39, *Ellema;* Butl., Tr. Zool. Soc. Lond. ix. 626, *Lapara;* Fernald, Sphing. 82, *Ellema.*

"Cinereous. Fore wings with a zigzag oblique black line, and with several lanceolate black marks. Hind wings brownish, paler toward the base; ciliæ white. Length of the body 10 lines ($\frac{1}{6}$ inch.); of the wings 24 lines (2 inches).

"Canada."

This is Walker's description, and what it referred to has been a puzzle to American entomologists. It has been referred by Mr. Grote as identical with *harrisii;* Mr. Strecker, on p. 117 of his work,

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gives *fide* Westwood, the following differences: "*Bombycoides* is much more brownish in tint, not near so leaden gray; the thorax is destitute of all black lines; the dark dashes on middle, near inner margin of primaries, are more central and nearer to base of the wing; the secondaries are without any appearance of dark central fascia, the fringe on anal margin is of the same dull brown as the rest of the wing; under surface of all wings is uniform pale brown."

In the following number he gives a figure of the species from a drawing made from the type. This represents an insect very much like *harrisii*, save that the pale shade between the outer lines is strongly marked and the basal line is reduced to a few black dashes. Mr. Strecker seems in doubt whether it is an aberrant form or a good species. Mr. Lintner claimed it a good species in his Ent. Cont. i. Prof. Fernald quotes Mr. Thaxter as having taken an *Ellema* "which is practically the same with Strecker's figure of *bombycoides*," and as far as he can judge is that species. He also expresses the opinion that it is a variety of *harrisii*.

Mr. Lintner showed me an insect in his collection, last winter, which he claims is Walker's species, and from a comparison made with *harrisii* at the time, it looked distinct; the fore wings are wider, less acute at tip, the costa more convex. The color is more shot with umber brown and the basal bands are wanting. The specimen was obtained from Mr. Meske as an imperfect *harrisii*, and was a bred specimen.

Mr. Meske assures me he never obtained *harrisii*, except by breed ing, and this insect given to Mr. Lintner must have been produced by a larva so like that of *harrisii* that he failed to note any distinction.

In view of all this I believe that this species will eventually turn out only an aberratic form of *harrisii*—hardly a variety—for were it a variety it would occur more frequently.

E. pineum Lint.,* Ent. Cont. i. 1872, 37, pl. 8, figs 12-13, *Ellema;* Bd., Sp. Gen. Lep. Het. i. 107, *Sphinx;* Grt., Buff. Bull. iii. 225, *Ellema:* Butl., Tr. Zool. Soc. Lond. ix. 626, *Ellema.*

♂.—Head and collar umber; palpi brown; thorax umber at the sides and brownish cinereous on the middle. Abdomen immaculate, brownish cinereous. Legs brown, with white scales on the femora and at the joints. Anterior wings as long as the body, umber colored, dusted with grayish at the base, along the terminal margin, and on the principal nervures and their branches; within the cell is a quadrangular blackish brown spot; an umber brown shade is placed over the base of the nervules, filling the lower half of the post-apical interspace half

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way to the hinder margin, entirely filling the disco-central interspace within one-third of the margin, the middle portion of the medio-superior, the base of the central and posterior interspaces; the outer margin of this shade is doubly curved, convex toward the hinder margin, becoming concave from the medio-superior nervule; the inner margin of the wing beneath the submedian nervure is brownish from the base to the middle; the tips of the nervules are touched with umber brown; cilia umber brown, spotted with white on the interspaces; posterior wings above and beneath ochreous gray, lighter at the base. Expands 1.75 inches; 43 mm.

♀.—Head and thorax umber brown, the latter grayish at the sides and in the middle, with a short white line on the upper edge of the patagiæ; anterior wings broader than in the male and longer than the body; color umber brown, with a darker brown costo-basal spot, another on the internal margin near the base, which is continued in a dark shade along the internal margin; a similar colored spot occupies most of the apical interspace and there are two within the post-apical; within the cell a subquadrangular blackish brown spot; of the umber brown shade, which in the male rests on the nervules, scarcely more than its hinder margin is visible, and that indistinctly; middle of the wing at base dusted with grayish scales and the nervules are also more or less dusted with grayish, especially the branches of the subcostal vein. Posterior wings above darker upon the apex and upon the hind margin than in the male, and beneath without the obscure band which crosses the middle of the nervules in *E. harrisii*. Cilia white, spotted with dark umber on the ends of the nervules. Expands 2.10 inches; 53 mm.

Hab.—New York, Canada.

Differs from *harrisii* in the darker color, the absence of the gray shades and the much less distinct markings. The insect is extremely rare.

Mr. Lintner has also described the larva, which resembles quite closely that of *E. harrisii*.

E. coniferarum A. & S.,* Ins. Ga. i. 83, pl. 42, *Sphinx;* Hüb., Verz. 139, *Hyloicus;* Wlk., C. Lep. B. M. Het. viii. 224, *Ancerya;* Clem.,* Journ. Ac. N. Sci. Phil. iv. 174, *Sphinx;* Morris,* Syn. 1862. 199, *Sphinx;* G. & R., Pr. E. S. Phil. v, 166, *Hyloicus;* Grt., Buff. Bull. i. 27, *Ellema;* id. ii. 228, *Lapara;* Bd., Sp. Gen. Het. i. 105, *Sphinx;* Grt., Buff. Bull. iii. 325, *Ellema;* Strk., Lep. Rhop. et Het. 93, 116, pl. 13, fig. 15, *Sphinx;* Koebele,* Bkln., Bull. iv. 20, *Sphinx;* Grt., Tr. A. E. Soc. ii. 115, *Hyloicus;* Lint.,* Ent. Cont. i. 32, pl. 8, figs. 10 and 11. *Ellema;* Butl., Tr. Zool. Soc. Lond. ix. 626, *Ellema;* id. 642, *Hyloicus;* Grote New List, 1882, 11, *Ellema;* Fernald,* Sphing. 85, *Ellema;* Edw.,* Ent. Amer. iii. 167.

cana Martyn, Psyche pl. 19, fig. 1 (1797), *Sphinx;* Butl., Tr. Zool. Soc. Lond. ix. 626, pr. syn.

Head and collar umber brown. Thorax and abdomen ashy gray, immaculate. Primaries ashy gray, with an inconspicuous brown line, dentate on the veins, preceded by a pale shade, crossing the wing from the outer fourth of costa to the outer fourth of hinder margin. This line is considerably rounded out beyond the cell and curving in between veins 2 and 3 runs from this place to the hind

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margin at right angles with it. Three cross lines starting from and visible only at costa divide the portion inside of the outer line into nearly equal parts. Two dark brown dashes rest, one between veins 2 and 3, the other between veins 3 and 4, and extend out to the outer cross lines. Fringes white, cut with brown at the ends of the veins. The under surface is pale brownish gray. Expands 2—2.35 inches; 50—59 mm.

Hab.—Canada to Florida.

This species is a variable one; according to Mr. Koebele, who has raised it in some numbers, it varies considerably. The primaries vary in width (in the sexes?) considerably, and they may be uniformly ash gray in color. Many specimens have the two black dashes near the middle of the wing; some have only one; some have a band of lighter gray across the wings, and some have dark lines and markings; some, apart from the color of the abdomen, which remains uniform, exactly resemble *Sphinx pinastri* of Europe.

The form above described is the most common, though the insect is never abundant. Abbot and Smith have figured the larva of this species on *Pinus palustris*, and represented it with a yellow head, the body checkered with light and dark gray squares. Mr. Koebele has given a more detailed account of the transformations in "Bull. Bkln. Ent. Soc." iv. 20.

EXEDRIUM Grt.

This genus, so far as I can find, is undescribed. Mr. Grote proposed it in his "New Check List" for Mr. Strecker's species *Sphinx halicarniæ*. This species I saw on one occasion in Mr. Strecker's collection, unfortunately without noting its structure. I give Mr. Strecker's original description of the species, which is all I know of it:

SPHINX HALICARNIE Strk., Bull. Bkln. Ent. Soc. iii. 35.—"♀ expands 2⅝ inches. Upper surface light fawn or drab gray, slightly darker on top of head, thorax and costa of primaries than elsewhere; towards and at the exterior margin of primaries somewhat whitish, though insensibly blending into the drab of the rest of wing, so as to make no marked difference. A rather short, dark brown streak in the space between the second and third median nervules and some brown on the fringe at termination of the veins is all the attempt nature has made in the decoration of this moth. The secondaries are light brown, paler at and towards the base, and with the fringe white and brown alternately; under surface light brown or fawn color.

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"One example was taken by Rev. George D. Hulst, in Florida, in summer of 1878.

"In Museum Strecker.

"This Sphinx, of which I append a figure in order to exhibit the great breadth of primaries, is without doubt the most remarkable species yet discovered in this country.

"Though evidently allied to the *coniferarum* group its peculiar bombycid appearance distinguishes it at once from all species yet known. Doubtless, like its nearest allies, it will be found to exist in the larva state on some species of pine."

Mr. Strecker's figure, if at all accurate, certainly does show a remarkable looking form. The primaries have the apex rounded, hind margin decidedly shorter than the outer margin. No structural details are given, but its location at the extreme end of the present series is probably correct.

SMERINTHINÆ.

Head retracted, comparatively small; palpi usually short, in *Cressonia* only, exaggerated and divaricate at tip. Antennæ fusiform, not recurved, and only very little curved at tip. In the male ciliated or pectinated, in the female simple. Tongue rudimentary in all the species. Thorax usually short, plump, convex; sometimes with an indistinct central ridge. Abdomen always untufted, cylindric, rarely conic, usually rather obtusely terminated. Legs subequal, short and weak, usually with only a single pair of small spurs at the ends of the median and posterior tibiæ. Vestiture woolley, fine and dense; supra-anal plate in the male genitalia flat and prolonged into a flattened, obtusely rounded hook. Primaries always more or less angulated or dentate, less so in *Cressonia;* inner margin always sinuate, the hind angle always more or less produced. Frenelum in the male very much reduced in size, barely discernible. Primaries without a loop for its reception; in the female it is reduced to a mere brush of short stiff hairs. Primaries with eleven or twelve veins; the same species sometimes variable in this respect. Internal vein furcate at base, running to the anal angle; median vein giving off 2 at about its middle; 3 about midway between 2 and the end of the cell, where 4 continues the median vein; cross-vein more or less angulated; 5 from the cross-vein, nearer to 4 than to 6; 6 and 8 from the subcostal, the latter to the apex, giving off 7 at about one-quarter from its in-

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ception; 9 from the subcostal to the costa near tip, sometimes forking near the end of its course giving off thus 10, which, when present, is always very short; 11 from the subcostal usually about the middle; 12 is the costal vein. Secondaries with the cell not extending to the middle of the wing, cross-vein variable; four always from the inferior angle; two usually from the middle of the median; three variable; five from the cross-vein at varying distances from four, usually closer to four than six; six and seven together from the end of the subcostal; costal vein variable, depending somewhat on the wing shape.

This subfamily is very distinctly separated in its entirety from the rest of the *Sphinges*, forming a division equal in value to all the rest. In its division I have met with considerable difficulty, less because there were no characters, but because there were so many that a genus might almost be based on every species. Indeed, this has been done, except for *myops*, which I believe is not a generic type. *Astylus* and *myops*, in fact, are the only species strictly identical in structure, except in the genitalia. The other extreme—lumping everything under *Smerinthus* seemed equally undesirable, and it was not an easy task to strike the correct mean. Prior writers seem to have had no definite basis for their subdivisions, a number of species being first associated in one way then in another, and finally separated altogether. The genital structure of the male has here again given valuable hints, and I believe the present arrangement as satisfactory as can be easily made. I have excluded the species of *Ellema* from the subfamily contrary to my previously expressed opinions, having convinced myself that Mr. Grote was more nearly right in considering them degraded *Sphinginæ*. Though having an aborted tongue, the wing form and habitus, as well as the genitalia, are more Sphingid than otherwise.

I head the species with *Triptogon*, which contains our largest species, and has the fore tibiæ armed with a long, stout claw. The genital structure is unique and described in its proper place. There is but a single species. I follow this by *Smerinthus*, which contains three species agreeing in type of genital structure, in the general body form, in habitus and in pattern of maculation. In all the dorsum of thorax between the patagiæ is deep brown, the primaries have an outwardly angulated band or line at basal third, and the secondaries have the ocellus black centred and connected by a black spur, with the anal angle; the costal margin is straight. In antennal structure these species differ greatly, and to a less extent in

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wing form. Under the term *Paonias* I unite three species again agreeing in type of genital structure in having a frontal crest between the antennæ, a rather narrow and indistinct, somewhat discolored thoracic crest, more conic abdomen, and in having the ocellus of secondaries without a black centre, and not connected with the anal angle; the apex of secondaries is lobed and the costal margin is sinuate. In this genus, too, there is some diversity in the outer margin. At the end of the series I place *Cressonia*, which is isolated from its allies in antennal structure—the males have the antennæ doubly bi-pectinated, each joint bearing two branches on each side. Clemens has observed this structure without deeming it of generic importance. The palpi, too, are unusually long, and are divaricate—all of them features which isolate the genus from all other American Sphinges.

The habits of the species are nocturnal. Having no tongue they are incapable of feeding; the wings are not built for sustained or rapid flight, the thoracic muscles being too little developed. They fly to light, however, and in that way many are taken. The larvæ, withal, are truly Sphingiform, and have the anal horn; they are granulated, and have the head triangular. Other particulars in regard to the larvæ may be gathered from the Introduction.

The pupæ are all subterranean and make no cocoon of any kind.

In tabular form the genera and species may be placed as follows:

1. Antennæ of male doubly bi-pectinated, palpi divaricate at tip.. .....5.
   Antennæ of male ciliate or singly pectinated, palpi closely applied to front .2.
2. Costal margin of secondaries sinuate, the apex produced or lobed. .....4.
3. Size large, thorax immaculate, anterior tibia with a long, strong curved claw, secondaries not ocellate .....**Triptogon modesta.**
   Smaller, the thorax with the dorsum between the patagiæ dark brown, secondaries ocellate.....**Smerinthus.**
   Antennæ of male pectinated; ocellus of secondaries with two blue pupils; fore tibiæ not armed.....**S. geminatus.**
   Antennæ of male ciliated; ocellus of secondaries single; fore tibiæ with a spine at tip.
   T. p. line not lunulate.....**S. ophthalmicus.**
   T. p. line lunulate.....**S. cerysii.**
4. Thorax with a narrow, slightly discolored crest; head crested between the antennæ.....**Paonias.**
   Outer margin regularly scalloped.....**P. excæcatus.**
   Outer margin not scalloped, simply slightly produced on veins 1, 3, 7 and 8.
   Ground color deep chocolate brown with lilac powderings; maculation distinct.....**P. myops.**
   Ground color pale yellowish brown, the maculation indistinct..**P. astylus.**
5. Secondaries not ocellate.....**Cressonia juglandis.**

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Belonging to this subfamily is the genus *Arctonotus*, which yet offers characters so peculiar that Mr. Grote placed it in the *Caudiberbes* with *Pogocolon* and *Aellopos*, while Mr. Butler questions its right to belong to the Sphingidæ at all. The species is so extremely rare that I have been able to examine only a single specimen, and I hold to my previously expressed opinion* that it belongs here rather than elsewhere. As, however, I have not been able to make the same careful examination as in the other forms I place it at the end of the series; in fact it must either end or head it, for it belongs nowhere else. It cannot remain where Mr. Grote puts it on account of its antennal structure as well as its other characters—in fact the only reason I can imagine for its position among the *Macroglossinæ* is the small size and plump form which somewhat resembles that of the species with which it is associated.

TRIPTOGON Brem.

Bull. de l'Acad. Imp. St. Petersb. 1861, iii.

Head sunken, small, with a small median crest. Palpi very short, terminal joint minute. Tongue minute, membraneous; vestiture fine silky hair. Antennæ fusiform, without a terminal hook; simple in the ♀, biciliate in the ♂. The ciliations are ranged in two series on each side of the middle of each joint, and approach at tip, forming thus an approach to the double bi-pectinations of *Cressonia*. Thorax plump, heavy, not tufted, the vestiture very dense, fine and silky hair. Abdomen plump, cylindric, obtusely terminated, uniformly covered with fine spinules which are concealed by the vestiture, which is somewhat flattened. Legs strong, short, subequal in length, the anterior shortest; in all the tarsi much exceed the tibiæ in length. Middle and hind tibiæ with a single pair of short terminal spurs, anterior with a stout curved spine at inner side of tip—not spinose. Tarsi finely spinose. Primaries large, with regularly scalloped outer margin and 12 veins; 10 very short, from 9 to the costa. Secondaries large, anal angle somewhat produced, outer margin slightly and irregularly sinuate; 8 veins, costal straight, or but little sinuate; 6 and 7 from the end of the subcostal; 3, 4 and 5 at equal distances from the end of the cell; 5 from the cross vein, much nearer to 4 than to 6.

The genital structure of the male is characteristic. The supra-anal plate is thick, bent into a broad flat hook. The inferior spur is

* Ent. Am. i, 86.

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also broad and flattened and meets the hook at the inner side of tip. The side pieces are very broad at tip, at the inferior angle with two curved corneous hooks. A narrow, elevated, corneous ridge runs close to but not entirely parallel with outer margin; inside of this is a broader ridge with flattened top, which is rough with elevated points and teeth. The American species is of large size and easily recognized.

T. modesta Harr., Sill. Journ. 36, 292, 1839, *Smerinthus;* Ag., Lake Sup. 388, pl. 7, fig. 7, 1850, *Smerinthus;* Clem., Journ. Ac. N. Sci. Ph. iv. 1859, 183, *Smerinthus;* Morr., Syn. 1862, 210, *Smerinthus;* G. & R., Pr. E. S. Ph. v. 161–185, 1865, *Smerinthus;* List. Lep. N. A. i, p. iv. 1868, *Smerinthus;* Grt., Buff. Bull. i, 24, *Laothœ;* id. ii, 227, *Amorpha;* Strk., Lep. Rhop. et Het. 60, pl. vii fig. 11, ♂, *Smerinthus;* Butl., Tr. Zool. Soc. Lond. ix. 589, *Triptogon;* Grt., Can Ent. ix. 132, *Triptogon;* Bunker, Can. Ent. ix. 210, *Smerinthus;* Edw., Pr. Cal. Ac. Sci. vi. 92, *Smerinthus;* Fernald, Sph. N. E. 71, *Triptogon.*

princeps Wlk., C. B. M. Lep. Het. viii, 255, *Smerinthus;* G. & R., Tr. A. E. S. ii. 76, pr. syn.

populicola Bd., Sp. Gen. Het. i, 22, *Smerinthus.*

Var. **occidentalis** Hy. Edw., Pr. Cal. Ac. Sci. vi. 92, *Smerinthus;* Strk., Lep. Rhop. et Het. 126; Grt., Buff. Bull. iii, 223; New List, 1882, an sp. dist.; Holland, Can. Ent. xviii. 105, var. pr.

imperator Strk., Lep. Rhop. et Het. 125, pl. xiv. fig. 3, *Smerinthus;* Grt., Lists pr. syn.

Head, thorax and abdomen pale gray or olivaceous, darker beneath, segments of abdomen paler marked or ringed. Basal third of primaries pale gray, with faint transverse shades. A broad, olive median band, the interior margin strongly defined, upright, slightly sinuate and dentate; the outer margin marked by a wavy, pale line. Outer part of wing olivaceous, somewhat paler than the median band, crossed by three lighter shade bands. Secondaries deep rosy red on the disc, pale gray on the costal and hinder margins, and olivaceous on the outer margin. A bluish gray patch near anal angle, with a black streak above it, and a pale fawn gray shade above that. Beneath olivaceous, with a broad dusky outer margin and a variable number of obscurely marked shade lines. Disc of primaries toward base clothed with longer, dense, rosy red hair. Expands 3.5—5.5 inches; 88—138 mm.

Hab.—Canada to Louisiana; westward to California.

A widely distributed but not very common species, and the largest American *Smerinthid.* The soft blending of olive and gray shades gives this species a beauty of its own, well expressed by its name. It varies in depth of ground color, and in the distinctness of the transverse maculation. Somewhat also in the form of the inner margin of the median band which is sometimes strongly indented. The pale form of the species has been named *occidentalis* by Mr.

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Edwards, and is the prevailing form on the Pacific slope, though Mr. Holland says he has it from Ohio not in any way differing from California examples. The life history is given by Mr. Bunker in Can. Ent. ix. 210.

Boisduval's description of this species is based upon the assumption that Harris' name is pre-occupied, but in that case *princeps* Wlk., would have to be used, and Boisduval's name is, in any event, a synonym.

T. imperator Strk., Lep. Rhop. et Het. 125, pl. xiv. fig. 3, *Smerinthus.*

Head above yellow fawn color, thorax violaceous gray, not dark; abdomen yellowish fawn shaded, somewhat darker dorsally, and with a faint dorsal line of violaceous extending the whole length; beneath pale fawn; legs violaceous. Upper surface: primaries general style of ornamentation somewhat as in *modesta* Harr. Basal third of wing very pale violaceous gray, yellowish at base, and traversed in its middle from costa to inner margin by an irregular darker shade; the outer edge of the basal third is very irregular and produced in a sharp angle at the innermost median nervule and is narrowly shaded where it joins the median space by a darker tint; the inner half of the median space is tinted with brownish, the outer half is of the same pale violaceous gray as the basal part; the outer edge of the median space is scalloped and shaded with darker gray; a large, pale discal mark; the third or terminal space is of the same pale gray as the major part of the rest of the wing, shaded on costal half with pale yellowish fawn, a darker patch on inner margin not far from inner angle. Secondaries dull crimson, yellowish white at inner margin and a large pale gray patch covers that part of the wing at and near the anal angle, within which patch is a blackish dash parallel with outer margin, between which latter and said dash is a faint gray abbreviated line extending from the anal angle inwards to where the crimson color commences. Under surface of all wings very faint yellowish fawn with a broad terminal band, but a shade darker; basal half of primaries dull crimson, which color does not extend to either costa or inner margin and the discal mark is designated by the pale fawn of the ground color of the wing. Expands 4.5 inches; 113 mm (♀).

Hab.—Arizona.

The above is almost a literal transcript of Mr. Strecker's description, which is quoted to present fully its claim to specific distinction. Mr. Strecker says on this subject: "This differs from its nearest ally, *modesta* Harr., in the far greater breadth of wing, the great robustness of body, the entirely different color and in the difference of the undulations of the transverse lines and shades, also in the shape and greater size of the discal mark or bar." Thus far Mr. Strecker.—Mr. Grote has, on several occasions, incidentally referred this as a synonym of *occidentalis* Hy. Edw., and so it stands in his last list, as I believe correctly. The most obvious difference is in the inden-

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tation of the median band of primaries, and this is a decidedly variable quantity, the size is not unusual for *modesta*, and it does not differ perceptibly in bulk or wing shape.

A third species has been described by von Reizenstein as *S. Cablei* in "Scribner's Monthly" from Louisiana. The larva also is described as horned and feeding on water plants. The determination that the species was new seems to have been made upon Mr. Grote's authority, but Mr. Grote has since disclaimed knowledge of the species, and in his new list (1882), he leaves it without number, and in a note to p. 10 he says: "This will probably turn out to be *modesta*." The larva differs considerably from that of *modesta* and Prof. Riley tells me it represents an *Arzama*. It therefore adds nothing to the species which does not seem as imago to be anything but *modesta*.

SMERINTHUS Latr.

Hist. Nat. Ins. p. 431.

Head small, sunken, the front smooth, not tufted, palpi short, in the males scarcely, in the female not exceeding front. Tongue rudimentary. Eyes small; antennæ fusiform, curved at tip, ciliate or pectinate in the ♂, simple in the ♀. Thorax short, convex; the vestiture with a plush-like appearance. Abdomen plump, cylindric, moderately long and tapering, the segments not spinulose. Legs subequal, short; unarmed in *geminatus*; the others have a very short, blunt spine at tip; middle and posterior tibiæ with a pair of small spurs at tip. Primaries with the venation of the group; 11, rarely 12 veined; the outer margin usually produced beneath the apex, and again on vein three. The species differ somewhat in this respect. Secondaries rather long, with costal margin straight, the anal angle somewhat produced.

The genitalia are after one general type. Side pieces oblique beneath, straight superiorly, the tip broadly rounded. From the upper margin arises near the tip a somewhat spatulate, concave, corneous process rounded at tip, and on the inner margin nearer base is a broader process, which tapers rather abruptly to a point. In *geminatus* there are two such. The supra-anal plate is produced into a broad, flat hook, with obtusely rounded tip, the inferior projection very much reduced in size.

Three species are referred to this genus, agreeing in general style of ornamentation, wing form and essentials of structure, yet sufficiently different to have been referred to as many genera.

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Geminatus has bi-pectinated antennæ in the ♂, a single branch to each side of each joint. The pectinations slender, curved, cylindrical, with rounded tip, fringed with fine ciliæ. The primaries have the outer margin slightly produced on veins one, three, seven and eight. The ocellate spot is geminate, i. e., the blue centre is completely divided by a black band. Rarely the band is not complete and the variety *jamaicensis* is thus formed. Mr. Grote has proposed the term *Eusmerinthus* for this species.

In *ophthalmicus* the antennæ of the ♂ have a single series of thin square laminæ, each nearly equal in length to the joint, and upon each side there are two rows of fine cilia which converge at the tip. The outer margin of primaries is somewhat produced on veins 1, 3, 4, 6 and 8, but less prominently than in the other species. The ocellus is single.

In *cerysii* the antennæ are similar to those in *ophthalmicus*; the outer margin of primaries are somewhat markedly produced over veins 1, 3, 4, 6, 7 and 8. The distinguishing structural feature is a very short blunt spine at the tip of the fore tibiæ to which Prof. Fernald first called attention and upon which Mr. Grote based his generic term *Copismerinthus*, not aware that *ophthalmicus* shared this peculiarity, and using another's labors to secure a new generic term. We are thus, fortunately, in possession of a generic term for every one of our species with the solitary exception of *myops*. I cannot find that this has been made the type of a genus.

It will be noted that in the arrangement here given the species add regularly to the number of dentations of primaries; *geminatus* has four; *ophthalmicus* and *cerysii* six; so that the species are distinguishable by this character alone.

Mr. Strecker's species *astarte* is a form of *cerysii*.

8. geminatus Say, Am. Ent. i, 25, pl. 12, *Smerinthus;* Harr., Sill Journ. 36, 29, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 246, *Smerinthus;* Lec. ed. Say Am. Ent. i, 25, pl. 12; Clem.,* Journ. Ac. N. Sci. Phil. iv. 1859, 183, *Smerinthus;* Morris,* Syn. 1862, 210, *Smerinthus;* Lint.,* Pr. Ent. Soc. Phil. iii. 665; Ent. Cont. ii, 119, life history; G. & R., Pr. Ent. Soc. Phil. v. 185, *Smerinthus;* Reed, Can. Ent. i. 40; Pack.* Guide 275, *Smerinthus;* Grt., Buff. Bull. i. 23, *Smerinthus;* Strk., Lep. Rhop. et Het. i. 56, pl. vii, figs. 6 ♂, 7 ♀, *Smerinthus;* Bd.,* Sp. Gen. Het. i. 39, *Smerinthus;* Butl., Tr. Zool. Soc. Lond. ix. 592, *Calasymbolus;* Grt., Can. Ent. ix. 132, *Eusmerinthus;* Buff. Bull. iii. 223. *Eusmerinthus;* Hulst,* Bull. Bkln. Ent. Soc. i. 67; id. ii. 35, *Smerinthus;* Fernald,* Sphing. 77, *Smerinthus;* Grt., Hawk Moths 35, *Calasymbolus.*

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Var. **jamaicensis** Dru., Ex. ii. 43, pl. 25, figs. 2, 3, *Sphinx;* Westw., ed. ii, 47, pl. 25, figs. 2, 3, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 247, pr. syn.; G. & R., Pr. Ent. Soc. Phil. v. 160, *Smerinthus* (an sp. dist.?); Lint., Ent. Cont. ii. 123, pr. syn.; Strk., Lep. Rhop. et Het. i. 57, pl. vii, fig. 8, *Smerinthus;* Grt., Hawk Moths 36, pr. var.

ocellatus Fabr., Ent. Syst. iii. 1, 355, *Sphinx;* Gmel., ed. Linn. S. N. 2371, *Sphinx;* Westw., ed. Dru. ii. 47, *Jamaicensis.*

Var. **tripartitus** Grt., Hawk Moths 36.

Head and thorax bright, somewhat corneous gray; palpi more reddish; dorsum of thorax rich deep brown, except at extreme base; the dark patch occupying the entire space between the patagiæ. Abdomen rather darker, more fuscous, with an indefinite, interrupted dorsal line and a series of still more indefinite, often obsolete lateral pale spots. Primaries gray, with a very variably marked rosy tinge. Basal space palest, with a pale transverse line marked by two darker shades through its outer third. From the basal third of costa a dark brown line runs outwardly oblique to vein two (more or less dentate on the median vein), then forming an angle that may be either acute, right or obtuse, inwardly obtuse, inwardly oblique to the internal margin at basal third. This line is very variable in its course, but is always outwardly angulate a little below its middle. At outer third of wing is a transverse shade band that may be either rigid, sinuate, or simply with an outward curve. Beyond this band the wing is darker to a series of three pale alternated by two darker, sinuate, transverse lines. The middle pale line may be wanting, in which case there seem two parallel pale lines with a broad dark shade between. Through the subterminal space is a very variably distinct paler shade, dilating some at anal angle, where it is preceded by a darker patch; and margining inwardly, a very distinct dark, apical lunule. A narrow lunulate patch, discal spot margined with brown. A deep brown shade from the middle of the angulated line at basal third, in the space between veins two and three and extending through and filling that interspace to the series of outer lines. In dark specimens this is not prominent, as the whole of the median space below the cell then becomes of a nearly equal tint; in pale specimens, on the contrary, it is very distinct. Secondaries rosy red, with costal and outer margin rather broadly buff or yellowish; a large ocellus near to and connected with anal angle with a blue centre which is divided into two by a central transverse band. Beneath, primaries rosy to the oblique shade at outer third, then darker, with the maculation of primaries much more distinctly reproduced. Secondaries with a linear white discal spot, a broad brown discal band; another near outer margin, staining the anal angle; between these brown bands is a series of three pale and two darker lines similar to those of the primaries Expands 2--2.75 inches; 50—69 mm.

Hab.—Canada to Virginia; Illinois, Kentucky, Jamaica?

A somewhat variable species, especially in the form of the ocellus of secondaries. Drury described his species from Jamaica, and figures it with a single ocellus. No one has since received the species from that locality and there was probably an error. Mr. Lintner, in a brood of *geminatus*, obtained a single female, which in all re-

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spects agreed with Drury's figure and description. Later Mr. Hulst obtained from normal ♂ and ♀ a brood of over thirty imagines. About half of these were of the normal form. Of the remainder one, a male, was a perfect specimen of the variety *jamaicensis*, and the rest filled every gradation between it and the type form. One specimen had but one or two blue scales to represent the second ocellus. In every case it was the inner ocellus which showed a tendency to be lost. The outer one seemed nearly constant, except in position. As the inner one faded the outer one approached a little the centre of the black space, which became at the same time less elongate. Mr. Hulst also speaks of a female in which a few scales represent a a *third* ocellus. Clemens also says that the spot may have two or three blue pupils. This form Mr. Grote has named *tripartitus* in his most recent *opus*, basing his action upon information obtained in Prof. Fernald's paper, as in the creation of the subgenus *Copismerinthus*.

The terms *jamaicensis* and *ocellatus* both have priority of *geminatus*. The latter is a synonym of the former. *Jamaicensis*, however, is not only a misnomer, but is inexpressive and absolutely misleading, whereas *geminatus* well expresses one of the most marked superficial features of the species, and refers also to the true stem form. I have, therefore, retained Say's name, following in this all prior writers on the group.

The genitalia of the male emphasize the other differences. The side piece is very broad at base, furnished inferiorly with a rather stout, somewhat beak-like, obtusely rounded tip. It suddenly narrows at this point from the declivity giving off another shorter, but rather more pointed spur, and finally from the upper margin near tip giving off a spatulated beak with rounded tip.

The larva has been mentioned, and more or less completely described by a number of authors.

S. ophthalmicus Bd., Ann. Soc. Ent. Fr. iii. 3d ser. 32, *Smerinthus;* Lep. Cal. Ann. Soc. Belg. xii. 67, *Smerinthus;* Clem., Journ. Ac. N. Sci. Phil. iv. 1859, 184, *Smerinthus;* Morr., Syn. 1862, 211, *Smerinthus;* G. & R., Pr. E. Soc. Phil. v. 160, *Smerinthus:* Lint. Ent. Cont. ii. 125, *Smerinthus;* Grt., Buff. Bull. i. 23, *Smerinthus;* Bd., Sp. Gen. Het. i. 31, pl. i, fig. 1, larva; Strk., Lep. Rhop. et Het. i. 58, pl. vii, fig. 5 ♀, *Smerinthus;* Edw.,* Pr. Cal. Ac. Sci. vi. 91; id. vii. 21; Butl., Tr. Zool. Soc. Lond. ix. 592, *Smerinthus.*

Var. **pallidulus** Hy. Edw.,* Pr. Cal. Ac. Sci. vi. 91; Strk., Lep. Rhop. et Het. 58, pl. vii. fig. 4 ♂; Grt., Buff. Bull. iii. 223.

Var. **vancouverensis** Butl., Tr. Zool. Soc. Lond. ix. 593, *Smerinthus.*

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Head brown, vertex paler. Thorax pale fawn, with the dorsum broadly deep brown, widening to the base—in fact leaving the patagiæ only pale; the latter sometimes with a rosy flush. Abdomen bright fawn color, immaculate. Primaries above dun or fawn of various shades. Base to the angulated line paler than the rest of the wing; median space below the cell darker, richer brown than elsewhere; beyond the outer transverse lines the wing is again darker with paler powderings toward apex and anal angle; an indistinct transverse line banded by a diffuse dusky shade each side, through the basal space. A very sharply defined outwardly oblique shade line from costa at basal third—narrow through the cell, broadening out below—to below vein two; there acutely angled and inwardly oblique, and somewhat convex to internal margin at basal third. This line is variable in the amount and acuteness of its angulation; sometimes the angle is rounded, and drawn out very acutely so as almost to meet the outer transverse line. A pale, somewhat yellowish, lunate, discal spot; the median vein broadly pale marked through the median space. A somewhat indefinite oblique transverse pale line at outer third, beyond which is another parallel to it, preceded by a dark shade. A very indistinct subterminal pale shade. An angulated pale mark before the apex, outwardly diffuse along costa. Anal angle pale powdered. Secondaries rosy at base, with broad pale fawn margins; a large, round, ocellate spot; black ringed, blue centred and with black pupil, connected with the anal angle by a short black dash. Beneath, rosy at base, pale fawn outwardly, the maculation of upper side reproduced. Secondaries pale fawn, with a discal spot and two parallel pale median lines. Expands 2.50—3.25 inches; 63—81 mm.

Hab.—California, Vancouver, Oregon, Washington Territory, Lake Superior.

This species seems variable only in the depth of ground color, and the paler form Mr. Edwards has named *pallidulus*. The variety intergrades fully and very gradually with the type form throughout its entire range. The species does not seem common. The side piece of the male is rather narrow, the tip obtusely rounded. From the upper side near the tip arises a spatulate corneous process, somewhat dilated and rounded at the tip. The projection from the lower margin is nearer the middle, and is very much stouter and longer, somewhat beak-like, acute at tip. Mr. Butler speaks of "A female example of a species from Vancouver's Island is also in the collection; although rather a large insect, it approaches very close to *S. ophthalmicus* ♀, as figured by Strecker, but has the primaries of a much browner tint, as in *S. ocellatus*, and less excavated below external angle; the central band forms a large, oblong patch on inner margin, and the whitish submarginal streak is less distinct. The secondaries are bright rose color, excepting a narrow buff outer border and a diffuse whitish patch at anal angle; the ocellus is larger. I propose to call it *S. vancouverensis*."

Mr. Edwards has described the early stages of this species.

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S. cerysii Kirby, Fn. Bor. Am. iv. 301, pl. iv, fig. 4, *Smerinthus;* Harr., Sill. Journ. 292, = *geminatus;* Wlk., C. B. M. Lep. Het. viii. 246, = *geminatus;* Grt. & Rob., Pr. Ent. Soc. Phil. v. 40, an sp. dist.; Beth., Can. Ent. xi. 151, *Smerinthus;* Lint., Ent. Cont. ii, 124 = *geminatus;* Strk., Lep. Rhop. et Het. 59, pl. vii, fig. 3 ♂, *Smerinthus;* Bd., Sp. Gen. Lep. Het. i. 35, *Smerinthus:* Grt., Buff. Bull. iii. 223, *Eusmerinthus;* Butl., Tr. Zool. Soc. Lond. ix. 592, *Calasymbolus;* Grt., Can. Ent. xviii. 133, *Calasymbolus;* Fern., Sphing. 79, *Smerinthus;* Grt., Hawk Moths 35, *Copismerinthus.*

Head and thorax fuscous gray or cinereous; dorsum of thorax rich, deep chestnut brown, widening toward base. Thorax fuscous, silky, with a slightly darker dorsal line and a series of indefinite paler lateral spots. Primaries ash gray, shaded and maculate with fuscous brown. Basal space pale, with a dusky shade, crossed by an indistinct whitish band. A little beyond basal third of costa a dusky, outwardly oblique band crosses the cell, widens into a broad shade below, acutely angled below vein two, thence inwardly oblique to the inner margin about two-fifths from base. A tolerably even, not very definite whitish shade runs from apical fourth of costa to the inner margin about one-third from hind angle. Within this, just beyond the cell, is a still more indistinct light fuscous shade line parallel to it; below the cell the space between the angulated basal line and the outer pale oblique line is dark fuscous brown; a pale, yellowish discal lunule, dividing a small discal spot; veins marked with yellowish beyond the cell. Beyond the whitish shade line the wing is darker, crossed by a lightly scalloped and somewhat sinuate pale band inwardly margined with darker fuscous; a powdery, pale subterminal gray shade widening at anal angle and at apex. Throughout, the costal region is suffused with gray. Secondaries rosy red, the margins fawn colored; a large ocellate spot near anal angle black ringed, blue centred and with a black pupil; connected with anal angle by a black spur from the outer black ring. Beneath, the primaries are rosy at base, the yellow discal mark prominent, outwardly fuscous, with gray powderings, the maculation of primaries reproduced. Secondaries gray, with fuscous powderings, outer margin rather darker, two parallel, fuscous transverse lines. Expands 3—3.15 inches; 75—79 mm.

Hab.—British America, Can., N. Y. (Adirondacks), Me., R. I.

This species is so extremely rare that very little can be said of it. The specimens have been very generally captured at light, and the early stages are entirely unknown. The side piece of the male seems broader than in its allies, the corneous processes very much as in *ophthalmicus.*

The species was long considered as synonymous with *geminatus* as no further specimens were obtained, but there is not the slightest doubt of its distinctness. It has also borne most of the generic terms proposed for this group, until it was finally made typical of a distinct term. It is rather more powdery than any of its allies.

S. astarte Strk., Pr. Ac. Nat. Sci. Phil. 36, 1884, 283.

"Male expands three inches; head brown; thorax above dark brown, patagiæ whitish gray; abdomen grayish brown above, more ashen beneath. Primaries

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dentated exteriorly, but not as deeply notched as in *cerysii*, but more so than *ophthalmicus*. Pointed apically more as in the latter, not so squarely cut off as in *cerysii*. Secondaries larger in proportion and more evenly cut on outer edge. Upper surface: ground color whitish gray, variegated with brownish shades and bands as in *cerysii* and *ophthalmicus*, not as much broken and zigzag as in the first, neither as clearly defined as in the last; the white discal line and accompanying line extending half way along the median nervure are boldly defined as in *cerysii*. Secondaries rosy with white at inner margin, grayish at costa and inclined to brownish at exterior margin. An anal ocellus black, with a bi-sected blue ring enclosing large black centre; fringe white. Under surface resembles closely that of the two allied species alluded to."

Hab.—Colorado; near Denver (Bruce).

Mr. Strecker, whose description is quoted, carefully discusses the question as to whether it might not be an intermediate form or a hybrid between the species with which he compared it.

Mr. Strecker's expressed belief that *cerysii* and *ophthalmicus* may prove varieties of the same species I am scarcely able to agree to, and the differences seem too great to be easily bridged.

A specimen seen in Mr. Graef's collection proves it a variety of *cerysii*.

PAONIAS Hüb.

Verzeichniss, 142.

Head sunken, moderate in size; palpi in the male reaching to the middle of the front; in the female scarcely exceeding front; tongue rudimentary; antennæ fusiform, curved at tip; ciliate in the male, simple in the female; vestiture fine and dense, forming a very distinct crest between the antennæ. Thorax moderate, convex, a somewhat elevated, obtuse ridge extending its full length. Abdomen elongate, slender, conic, pointed, untufted. Legs subequal, anterior rather the stoutest, unarmed; middle and hind tibiæ with a pair of minute spurs at tip. Primaries narrow, inner margin sinuate, the anal angle produced; outer margin very oblique, varying from regularly crenulated (*excæcatus*), to an almost even one (*astylus* ♂); eleven veined, disposition of veins not essentially different from the others of the subfamily. Secondaries almost subquadrate, the costal margin sinuate, roundedly produced upward at apex; the costal vein sinuate to accommodate itself to the margin, else essentially as in its allies. Genitalia of the male with side pieces narrowing to an obtusely rounded tip, upper margin nearly straight; a broad corneous process various in shape from the middle of the inferior margin.

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Under this generic term I unite the species of *Calasymbolus* Grt. The essential points wherein the three species here united differ from the others of the family, are the shape of the secondaries, and the structure of the male genitalia.

Calasymbolus was created by Mr. Grote (Bull. Buff. Soc. N. Sci. i. 23) for *P. astylus*, and *myops* was (loc. cit.) placed in *Paonias*. *Astylus* and *myops*, however, were so closely related that they were united under the same term in later papers. Mr. Butler adopts the genus *Calasymbolus*, but places in it also *geminatus* and *cerysii*. Mr. Grote later created the term *Eusmerinthus* for *geminatus*. In his latest *opus* (The Hawk Moths of North America) the generic term *Calasymbolus* is retained; *Eusmerinthus* is made a subgenus of it with *geminatus* as sole type, while for *cerysii* the subgeneric term *Copismerinthus* is proposed. It will thus be seen that there was no very definite idea conveyed or understood by Mr. Grote under the term *Calasymbolus*. *Paonias* has been very generally used for *excœcatus*.

The three species which I place in the present genus agree also in general pattern of maculation. In all, there is on the primaries an oblique darker line or dark shade from the basal third of costa to or near the anal angle, and a series of similar undulated transverse lines beyond the middle. The secondaries have similar ocellate spots and the costal half of wing is darker.

Excœcatus differs from the others in more distinctly ciliated male antennæ, in the rather evenly scalloped margin of primaries, and in the red color of secondaries. The abdomen is also stouter, and the species thus forms a distinct group in the genus. A greater number of entirely similar species might authorize the restriction of *Paonias* to forms of that kind.

Myops is deep brown, more purplish than the preceding, the maculation distinct. The primaries are truncate at the apex, slightly excavate to vein three, where the margin is somewhat produced; thence slightly excavated again to the produced anal angle.

Astylus ♀ agrees in wing form. My single ♂ differs in having the outer margin nearly entire, the angles being scarcely indicated. The species is much paler, more yellowish brown, and the transverse maculation is much more indistinct.

The agreement in genital structure as well as in the shape of secondaries unite these three forms. The differences in the outer margin of the wing are hardly of generic value. It may be added that the supra-anal plate of the male is modified into a flattened, obtusely terminated hook, and the inferior projection is small and slight.

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P. excæcatus A. & S., Ins. Ga. i. 49, pl. 25, *Sphinx;* Hüb., Verz. 142, *Paonias:* St. Farg. and Serv. Enc. Meth. x. 441, *Smerinthus;* Harris, Sill. Journ. 36, 290, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 246, *Smerinthus;* Clem., Journ. Ac. N. Sci. Phil. iv. 1859, 182, *Smerinthus;* Morris, Syn. 208, *Smerinthus;* Harris, Inj. Ins. Flint ed. 327, fig. 155, *Smerinthus;* Lint., Pr. E. S. Phil. iii. 666, larva; G. & R., Pr. E. S. Phil. v. 160, *Smerinthus;* Lint., Ent. Cont. ii. 127; Pack. Guide, 275, *Smerinthus;* Sanb. Can. Ent. i. 48 (50); Grt. Buff. Bull. i. 23, *Paonias;* Bd., Sp. Gen. Het. 1, 38, *Smerinthus;* Strk., Lep. Rhop. et Het. 54, pl. vii, figs. 1 ♂, 2 ♀, *Smerinthus;* Butl., Tr. Zool. Soc. Lond. ix. 590, *Paonias;* Saund., Fruit Ins. 85, figs. 83 and 84, *Smerinthus;* Fernald, Sphing. 73, pl. vi, fig. 1 and 2, *Paonias;* Beutenmuller, Ent. Am. i. 196 (list of food plants); Saund., Can. Ent. xvi. 10, figs. 1 and 2, *Smerinthus;* Fischer, Can. Ent. xvi. 17; Grt., Hawk Moths 30, *Paonias.*

pavonina Gey. Zutr. 5, p. 12, figs. 835 and 836, *Paonias;* G. & R., Pr. E. S. Phil. v. 160, 185, *Smerinthus;* Grt., Buff. Bull. i. 23, *Paonias;* id. ii. 226, pr. syn.; Bd., Sp. Gen. Het. i. 37, an sp. dist.; Strk., Lep. Rhop. et Het. 54, pr. syn.

Head and thorax light fawn color; top of frontal crest and a broad dorsal band of thorax chestnut brown; vestiture white-tipped at base. Abdomen usually somewhat darker, often concolorous with thorax, with dusky dorsal and lateral lines, the latter sometimes wanting; often a series of obscure paler spots on each side of the middle. Beneath, as a whole, paler, more reddish. Primaries light fawn at base, darker beyond the oblique shade. Basal space crossed by one or two darker wavy lines, which are sometimes wanting. A broad shade band extends obliquely from costa at basal fourth to the internal margin near the hind angle, where it is marked by three black spots. This shade is widest on the disc. At outer fourth there is a sinuate broad pale shade, in which are three narrow darker lines; a distinct brown discal spot; a pale subterminal transverse shade dentated opposite the apex. The excised part of the scallops of external margin is white; usually the specimens are very distinctly marked; rarely the maculation is suffused. Secondaries with rosy red, the costal region darker; a large black ocellus near anal angle with a round blue pupil; the fringes also white tipped. Beneath, primaries rosy red on disc, outwardly darker, with the maculation of primaries reproduced. Secondaries pale fawn, tinged with rosy red at base, with a broad paler median band, in which are three somewhat irregular dusky lines. Expands 2.5—3.75 inches; 63—93 mm.

Decidedly variable in size and ground color; sometimes the males are much darker with an olivaceous shade, more or less tinged with purple. The corneous process of the male side piece is broad, rounded at tip, emarginate superiorly before tip, the upper edge of the emargination serrate. Sometimes vein 9 of the primaries forks near the apex and then the full number of 12 veins is present. This, however, seems rather rare.

The species is distributed throughout the Eastern United States and Canada, and is perhaps the most common of the Eastern *Smerinthinæ;* there are two annual broods.

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P. myops A & S.,* Ins. Ga. i. 51, pl. 26, *Sphinx;* Hüb., Verz. 142, *Paonias;* St. Farg. & Serv. Enc. Meth. x. 441, *Smerinthus;* Harris,* Sill. Journ. 36, 291, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 245, *Smerinthus;* Clem.* J. A. N. Sc., Phil. iv. 1859, 181, *Smerinthus;* Morr., Syn. 1862, 207, *Smerinthus;* Harr.,* Inj. Ins. (Flint ed.) 328. *Smerinthus;* G. & R., Pr. E. S. Ph. v. 160, *Smerinthus;* Grt., Buff. Bull. i. 23, *Paonias;* Strk., Lep. Rhop. et Het. 55, pl. vii, fig. ♀ ♂, *Smerinthus;* Grt., Buff. Bull. iii. 223, *Calasymbolus;* Bd. Sp.* Gen. Het. i. 41, *Smerinthus;* Peck.,* Can. Ent. viii. 239, *Smerinthus;* Hulst,* Bkln. Bull. iii. 99, *Smerinthus;* Butl., Trans. Zool. Soc. Lond. ix. 594, *Paonias;* Saund.,* Fruit Ins, 208, fig. 14, *Smerinthus;* Fernald,* Sphing. 75, pl. vi, fig. 3, *Smerinthus;* Saund.,* Can. Ent. xvi. 11, fig. 3 *Smerinthus;* Bunker,* C. E. xviii. 207, *Smerinthus;* Grt., Hawk Moths 35, *Calasymbolus.*

rosacearum Bd. Sp. Gen. pl. xv. fig. 4, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 245, pr. syn.; Bd. Sp. Gen Het. i. 41, *Smerinthus* et sp. dist.

jamaicensis ‡ Butl., Tr. Zool. Soc. Lond. ix. 591, *Paonias.*

Head and thorax rich chocolate brown; palpi paler; a dorsal stripe on thorax paler. Abdomen sometimes darker, usually paler, with a dusky dorsal line, sometimes with irregular tawny spots; segments sometimes indistinctly paler ringed. Primaries chocolate brown; basal space paler, with a dusting of lilac scales, crossed by two darker rather indistinct wavy lines. A very oblique, distinct brown shade line from basal third of costa to hind margin somewhat beyond the middle, where it joins an elongate purplish blotch resting on the hind margin and extending nearly to the anal angle. A series of undulated dark and lilac transverse lines at outer fourth of wing; a yellowish ante-apical costal patch, and another of the same color before anal angle. Through the terminal space extends a lilac shade line angulated or dentate opposite the apex. A series of darker interspaceal longitudinal shades in the outer portion of wing most marked opposite the cell and elsewhere often obsolete. A small, brown discal spot. Secondaries: disc dull yellow, costal region and outer margin to middle chocolate brown; a yellow patch at apex. Ocellus black, with a large blue pupil. Beneath, primaries rusty reddish brown basally, outwardly darker, with the maculation of primaries distinctly reproduced. Secondaries reddish yellow brown crossed by a series of pale blue undulated lines, outer margin broadly brown to the middle. Thorax and abdomen beneath powdered with pale blue. Expands 2—2.5 inches; 50—62 mm.

Hab.—Canada to Georgia; westward to the Mississippi.

The corneous process of the ♂ genitalia is rather large and broad, the tip produced at the upper angle into a short beak.

The species is rare usually, though not difficult to raise if one seeks the larva. There is little variation in the species so far as it has come under my notice, except in depth of ground color and distinctness of maculation. From its nearest ally, *astylus*, it is easily separated by the darker color and more complete maculation. The larva has been often figured and described, but we have no complete life history, and the descriptions vary so greatly as to indicate extreme inconstancy in color.

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P. astylus Dru., Ill. ii. 45, pl. 26, fig. 2, *Sphinx;* Westw., ed. ii. 48, pl. 26, fig. 2, *Smerinthus;* Harr., Sill. Journ. 36, 290, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 245, *Smerinthus;* Clem., Journ. Ac. N. Sci. Phil. iv. 1859, 184, *Smerinthus;* Morris, Syn. 1862, 211, *Smerinthus;* G. & R, Pr. E. S. Phil. v. 161, *Smerinthus;* Grt., Buff. Bull. i. 23, *Calasymbolus;* Bd., Sp. Gen. Het. i. 40, *Smerinthus;* Strk., Lep. Rhop. et Het. 56, pl. vii, fig. 10 ♂, *Smerinthus;* Peck, Can. Ent. viii. 239; Butl., Tr. Zool. Soc. Lond. ix. 591, *Calasymbolus;* Fernald, Sphing. 77, *Smerinthus;* Grt., Hawk Moths 35, *Calasymbolus.*

integerrima Harr., Cat. Ins. Mass. 1835, *Smerinthus;* Sill. Journ. 36, 290, pr. syn.

io Bd. in Guer. Ic. Reg. An. Ins. pl. 84, fig. 2, *Sphinx;* Griffiths, Cuvier An. Kingd. Ins. ii. pl. 83, fig. 2, *Smerinthus;* Wilson, Brit. Encycl. Ent. 246, pl. 236, fig. 5, *Smerinthus;* Wlk., C. B. M. Lep. Het. viii. 245, pr. syn.

Upper surface reddish brown of varying shades, deeper in the ♀. Thorax with a dorsal ferruginous stripe, tegulæ sometimes tinged with rosy. Abdomen with a distinct dorsal and lateral dark line in the ♀, laterally also marked with bluish gray; in the ♂ the dorsal line only is distinct. Primaries paler, sometimes whitish towards base, in well marked specimens crossed by two undulating darker lines, which are, however, usually wanting. A very distinct brown, transverse line from costa at basal third, to the hind margin near the hind angle; terminating on a somewhat purplish dark patch, which runs for a variable distance along the inner margin. Beyond this line the wing is often powdered with lilac or pale blue, most distinct outwardly; a series of three or four dusky lines with paler, powdery interspaces from costa at outer fourth, gradully losing themselves in the ground color before or at the middle of the wing; a large yellow spot before the apex and a smaller, yellow, or whitish spot before the anal angle; a pale, bluish shade through the terminal space. The terminal space is often darker and the interspaces opposite the cell often show dusky longitudinal shades. From the ante-apical pale spot a rusty shade sometimes runs to the disc, narrowing and losing itself in the ground color. Discal spot small, brown, often wanting. Secondaries with disc yellow, ocellate spot black, the pupil blue; the costal region is darker, brownish, with two paler lines crossing it before the apex. Beneath, primaries paler at base than upper side, outwardly darker, the markings of upper side reproduced and much stronger. Secondaries dusky toward base; three dark, somewhat irregular discal transverse lines with pale interspaces. Outer margin irregularly rather dark brown, the space between the dark margin and the discal lines is brighter, more ochre yellow, and is the lightest part of the wing. Expands 2.25—2.50 inches; 56—63 mm.

Hab.—Canada to Massachusetts, N. Y., N. J., Pa.

The corneous projection of the side piece of the ♂ genitalia is short, very broad, spatulate and obtusely rounded.

This is one of the rarest of the group, and does not seem widely distributed. It is very close to *myops* in pattern of maculation, but is much paler, the markings very much less distinct. It seems more variable than the specimens seen by me would indicate, the variation being in the shade of the lighter parts of the wing. Mr. Strecker's

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figure of this species is not up to his usual work in this line. The difference in shape of the outer margin is marked and rather unusual. A ♀ in my collection agrees with *myops* in every particular; a ♂ from the same brood also in my collection has the margin entire and not at all angulate. My specimens are both perfect. Other specimens which I have seen are more or less intermediate. It is in all an easily recognized species.

The life history is very imperfectly known. Mr. Strecker described the larva in general terms from a figure "in which it is represented as being 1¾ to 2 inches in length; of a pale green color, beautifully variegated with dorsal and lateral yellow and red stripes and spots, somewhat in the manner of *S. myops*." Mr. Peck, in "Can. Ent." viii. 239, says: "A characteristic of *astylus* is its caudal horn, which is armed with two spines at its tip, appearing bifurcate at first glance. These spines are constant from its hatching. Color of horn, dark brown at tip and base; pale green at tip and centre, pointing forward." At the last molt this dark brown fades to an extremely light shade. It feeds from six to seven weeks, and the consequent exposure to parasitic attack may in some measure account for its rarity. The food plants are *Vaccinium corymbosum*, *Rosaceæ* and low Huckleberry (Fernald).

CRESSONIA G. & R.

Pr. E. S. Ph. v. 161; id. 186.

Head small, sunken, larger, somewhat more prominent in the male, in which also the eyes are globose. The vestiture is hairy, forming a frontal ridge between the antennæ. Palpi rather slender, the vestiture rather rough, directed forward, divaricate at tip, terminal joint minute. In the male they are unusually long, often considerably exceeding the vertex, while in the female they scarce reach the middle of the front and are not so stout; all intermediate forms are found. The tongue is rudimentary. Antennæ rather short, fusiform, in the male doubly bipectinated, the branches ciliate, becoming shorter to the tip. As in the Saturniidæ there are two branches to each side of each joint, and the branches join in pairs at their tips. Unlike *Saturnia* (used in its broadest sense), however, the two branches of the same joint approach at tip instead of the anterior of one joint to the posterior of the next. In the females the antennæ are simple. Thorax short and stout, subquadrate; vestiture

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hairy, forming a slight, usually discolored crest, which divides near the base in the form of a λ; in the female this is much less distinct and often concolorous. The abdomen is long, slender and conic in the ♂; stouter, more nearly cylindric in the ♀. The male also has minute anal tufts. The legs are moderately stout, subequal in length, the median pair rather the longest. The tibiæ are all densely covered with fine short spinules, the anterior clothed outwardly with rather long, dense hair; median tibia with a pair of medium sized spurs at tip, posterior with two pairs. Primaries with apex acute, outer margin rounded, sinuate, sometimes a little dentate, hind angle prominent, inner margin sinuate; eleven veined; not differing to any extent from its allies. Secondaries rather evenly rounded, the margin entire, or only slightly dentate.

The supra-anal plate of the male narrows rather rapidly and forms a rather long flattened hook slightly bent and obtusely rounded at tip. The inferior spur is short, not more than half the length of the superior hook. The side pieces are broad, the superior margin straight, the inferior rounded and gradually approaching the superior at the tip, where it forms a somewhat acutely rounded angle. From the middle of the superior margin arises a stout, somewhat curved corneous process with an obtuse tip and serrated inferior margin.

This is certainly one of the most remarkable and strongly characterized of the *Smerinthid* genera. The antennal structure is unique among the American forms, as is also the shape of the palpi. The frenelum is wanting altogether in the female, and reduced to a mere rudiment in the male. Its affinities with the Saturniidæ are therefore marked, and consequently I place this genus at the extreme end of the series.

There is but a single species thus far described in our fauna. It forms Clemens' Group II of *Smerinthus*, and Clemens also noted the peculiar antennal structure without giving it the value it merited. I pointed out its bearing in Soc. Ent. ii. No. 1, and in Ent. Am. iii. p. 2.

C. juglandis S. & A.,* Ins. Ga. i. 57, pl. 29, *Sphinx;* Hüb., Saml. i. 171, *Amorpha;* Verz. 141, *Polyptychus;* St. Farg. & Serv. Enc. Meth. x. 441, *Smerinthus;* Harr.,* Sill. Journ. 36, 291, *Smerinthus;* Wlk.,* C. B. M. Lep. Het. viii. 247, *Smerinthus;* Emmons,* Nat. Hist. N. Y. Ins. pl. 45, fig. 9, ? *Bombyx;* Harr.,* Inj. Ins. Flint ed. 328, *Smerinthus;* Clem.,* Jour. Ac. N. Sci. Phil. iv. 1859, 185, *Smerinthus;* Morris,* Syn. 1862, 213, *Smerinthus;* Lint.,* Pr. E. S. Phil. iii. 668, *Smerinthus;* G. & R., Pr. E. S. Phil. v. 161 and 186, *Cressonia;* Sanb.,

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Can. Ent. i. 48 (50) *Cressonia;* Grt., Buff. Bull. i. 24, *Cressonia;* Bd.,* Sp. Gen. Het. i. 27, *Smerinthus;* Strk., Lep. Rhop. et Het. 53, pl. vii, fig. 12 ♂, 13 ♀, *Smerinthus;* Butl., Tr. Zool. Soc. Lond. ix. 590, *Cressonia;* Pack.* Guide 274, *Cressonia;* Edw.,* Pap. iii. 127, *Cressonia;* Fernald,* Sphing. 80. *Cressonia:* Grt., Hawk Moths 36, *Cressonia.*

robinsonii Butl., Tr. Zool. Soc. Lond. ix. 590, *Smerinthus;* Strk., Lep. Rhop. et Het. 140; Grt., Buff. Bull. iii. 223, pr. var.; Maassen, Stett. Ent. Zeit. 1880. v. 41, p. 62, pr. syn.

♀ **pallens** Strk., Lep. Rhop. et Het. 54, pl. vii, fig. 14; id. 141, *Smerinthus;* Grt., Buff. Bull. ii. 150, pr. syn.; Butl., Tr. Zool. Soc. Lond. ix. 590, an sp. dist.? Maassen, Stett. Ent. Zeit. 1880, v. 41, p. 62, pr. syn.

Ground color of upper side varying from pale gray to deep fawn color; primaries often with a lilac purple suffusion. Palpi darker than other parts of head. Thorax usually with a darker brown line, marking the thoracic crest. Abdomen with the edges of the segments often narrowly paler or darker. Beneath, the forelegs and prothorax are darker than the rest of the under side, which is elsewhere of the same general color as the upper side. Primaries with a rigid, upright, transverse line at basal third; within this, and rather close to it, is another more indistinct line, more nearly perpendicular to the costa, and therefore not quite parallel to the other line. From the costa at outer third a transverse line, much bent at its inception, runs obliquely inward to the middle of the internal margin. Just beyond is another similar line the inclosed space usually somewhat paler than the rest of the wing; within the first mentioned line is usually a parallel, deeper, suffused shade, which is sometimes wanting and sometimes connected with the line, forming a single broad dark band. Outer portion of wing usually more or less shaded with brown; in well marked specimens the space is brown, except a pale costal patch from which a diffuse pale shade runs to the hind angle. The discal spot is brown. The inferior portion of median space is darker brown, shading off into the ground color; rarely this darker shade is wanting. Secondaries with two parallel, median, transverse lines, which inclose a usually paler space, the lines preceded and followed by a more or less distinct dusky shade, the inner one sometimes forming a third parallel line. Beneath brown, irrorate, paler at base of primaries, the two parallel outer lines of primaries reproduced, preceded on both wings by dusky brown shades. Beyond these lines the secondaries are brown to the outer margin, the fringes marked with gray lunules; on the primaries the gray subterminal shade of the primaries is reproduced. Expands 2.5--3.5 inches; 63--88 mm.

Hab.—Canada to Georgia; westward to Mississippi, Texas.

This species is perhaps the most variable of the Smerinthid forms. It varies remarkably in size, largely in color, and greatly in the distinctness of maculation. Mr. Strecker's *pallens* is based on a very pale specimen in which the upper surface is uniformly ochraceous and the transverse lines very narrow. A specimen in my own collection has the ground color so dark that all save the basal lines are lost on the primaries. The *robinsonii* of Mr. Butler is based on an unusually large specimen.

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Though widely distributed the insect seems nowhere common, probably less because of its absolute rarity, than because the imago does not feed, and is therefore seldom seen on the wing like the more typical forms of the family. The larva has been described by nearly every author since Abbot, and yet the early stages are not fully known. Abbot figures it as ferruginous, but says that it is sometimes green. Harris, Clemens and Morris all seem to have drawn their information from the same source.

ARCTONOTUS Bd.

Ann. Soc. Ent. Fr. ser. 2, x, 319.

Plump, robust, vestiture very dense, rather loose and woolley. Tongue obsolete. Palpi thick, short, pilose. Antennæ fusiform, stout, serrate, with bunches of rather lengthy bristles on each side in the ♂; in the ♀ simply ciliate. Abdomen short, thick, obconic. Thorax stout, without distinct tuftings, but the patagiæ and collar marked. Legs short, stout, anterior heavily armed at outer side and tip with long curved corneous claws; median and posterior tibiæ spurred as usual. Primaries slightly acuminate at tip, rather oblique and slightly convex along the outer margin. Secondaries rounded; the venation seems to present nothing peculiar.

I regret that lack of material has prevented my making a closer study of this remarkable genus, but there is nothing like it, and it cannot be mistaken. Walker considers it a link between the *Bombycidæ* and *Smerinthinæ*. Butler doubted its belonging to this family at all, while Grote places it near the head of the series. It is less Bombycid than *Cressonia*, or even *Ellema*, and I believe furnishes rather an intermediate form between *Smerinthus* and *Pogocolon* with most structures of the former.

A. lucidus Bd., Ann. Soc. Ent. Fr. 2d ser. x, 319; Lep. Cal. 1852, 47, *Arctonotus;* Wlk., C. B. M. Lep. Het. viii. 265, *Arctonotus;* Clem., J. A. N. Sc. Ph. 1859, iv. 188, *Arctonotus;* Morr., Syn. 1862, 217, *Arctonotus;* G. & R., Pr. E. S. Ph. v. 169, *Arctonotus;* Grt., Buff. Bull. i. 17; id. ii. 225, *Arctonotus;* Bd., Sp. Gen. Lep. Het. i. 293; Edw., Pr. Cal. Ac. Sci. vi. 87; Strk., Lep. Rhop. et Het. 113, pl. xiii, fig. 7, *Arctonotus;* Butl., Tr. Zool. Soc. Lond. ix. 627, *Arctonotus.*

Head, palpi, antennæ, thorax and abdomen, yellowish olive. Thorax, with the tegulæ a little darker and edged narrowly with white. Abdomen with a small anal tuft; anterior wings yellowish olive, with a darker median band, not reaching the inner margin, and surrounded by an oblique, rich purple border along the interior margin, and obsolete before reaching the costa. This border

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has a rather brilliant metallic reflection. Beyond the middle is a notched shade band of olive resting on the costa, a small linear patch near the apex and a lunate streak near the internal angle of the same color. Fringe of the exterior margin yellowish, with the edges brown; that of the internal margin purplish, concolorous with the oblique band. Posterior wings reddish fawn color at base, with a rich, claret-red submarginal band, narrowing inwardly and lost in the brown hairs of the anal angle. Margin broadly reddish fawn color, the same shade as the base of the wings. Underside grayish olive, with a ferruginous patch on disc of anterior wings. Fringes deep fawn color. Expands 2 inches; 50 mm.

Hab.—California, Oregon.

This description is after Mr. Hy. Edwards, and is copied because I could not improve on it. I regret that I can find nothing of its early stages which might add something to our knowledge of the location of this peculiar form. It is extremely rare.

POSTSCRIPT.

The manuscript of the foregoing monograph was practically completed nearly two years ago. A variety of reasons prevented its immediate presentation for publication, and after acceptance it was compelled to take its turn. For over six months it has been running through the press, and before it finally reaches its readers the work will be fully two years old.

In an order like the Lepidoptera, and an attractive family like the *Sphingidæ*, two years often suffices to greatly increase or improve our knowledge, and a monograph long delayed may become antiquated even before being published. In the present case no such fatality has taken place; but there have been several publications referring to the family, since its completion, and I have been able in some cases to see a much greater material than was accessible to me at the time of writing. Mr. Edwards has published also one new species since the MSS. went to the printer. The bibliographical references are therefore not quite up to date in all cases, but are, I think, complete to the beginning of 1888.

The greater material seen has, until quite recently, but confirmed my conclusions. In August, 1888, I had an opportunity of studying the collections of Mr. David Bruce, of Brockport, N. Y., containing many rare species, and large series of others taken by Mr. Bruce in Colorado. On two points this collection modified and corrected conclusions arrived at from lack of larger material. I find that I had,

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following Dr. Holland, mistaken the type of Mr. Edwards' *S. vancouverensis* for a small *drupiferarum*, or more correctly had mistaken a small *drupiferarum* for *vancouverensis;* an error not difficult to make by-the-bye. A specimen named by Mr. Edwards in Mr. Hulst's collection first attracted my attention to a possible error, and an examination of Mr. Bruce's series showed Mr. Grote to have been correct in referring it to *vashti* Strk. The series showed more, however; it proved that *albescens* Tepper, belongs to the same series, and that the only character found by me to separate the two—the dusky thorax of *albescens*—was not a specific one, but was seasonal. Mr. Bruce states that there are two annual broods, of which one is always *albescens* and the other *vashti* (*vancouverensis*). The synonymy must be, therefore, corrected to agree with this.

The other point upon which Mr. Bruce's collection shed a quite unexpected light was in regard to *Smerinthus astarte* Strk. From Mr. Strecker's very good description I had concluded it must be *S. ophthalmicus;* afterward a single specimen in Mr. Graef's collection could not be separated from *cerysii*, and I so referred it in the list of species in "Ent. Amer." vol. iv. p. 89. Mr. Bruce showed me quite a series of *astarte* and *ophthalmicus*, and an undoubted *cerysii*, and I have been compelled, unwillingly enough, to conclude all three as forms of one species, the variations being geographical. The difference in outline of primaries between *cerysii* and *ophthalmicus* is marked, as is also the appearance of the t. p. lines, and I certainly never expected to find any specific connection between the two, though the genital structure is practically identical. The series of *astarte*, largely bred, shown me by Mr. Bruce, was convincing. A full series of intergrades so far as wing form is concerned was readily found, while no specimen had the t. p. lines so strongly lunulated as in *cerysii*. This, however, is the only difference that I can find and the difference is not greater than is found in specimens of *T. modesta*. According to Mr. Bruce there are two broods of *astarte* —the one pale corresponding to Mr. Edwards' variety *pallidulus* of *ophthalmicus;* the other, dark, corresponding to the type form. Whether or not *cerysii* is double brooded we do not know. It is difficult to class these forms as varieties, but we cannot call them species. The synonymy of the species must be amended as shown in the following list of species.

These are all the points in which I have found reason to change my conclusions. Mr. Bruce's collection of *Hemaris* indicates a new

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species, but I prefer to leave these species for the present as they now stand.

A minor and yet serious point is in the very title of the paper. At the time it was written I felt very strongly that certain of the species in our lists did not belong to our fauna, though undoubtedly captured within the territorial limits of the United States. My ideas on the subject were not definite and I followed in my title the time-honored usage of referring to America, North of Mexico. Since that time Mr. E. A. Schwarz has visited semi-tropical Florida and has given us very definite ideas of the character and extent of its fauna and flora. The discussion of this matter in the Ent. Society of Washington, during which Dr. Horn drew a sketch of a limit of our fauna from that of Mexico, scarcely less sharp than that separating semi-tropical Florida, added still more to fix my opinions on the subject. The title, therefore, does not accurately express the scope of the present paper; it should be *Monograph of the Sphingidæ of Temperate North America.*

The new species described, is:

Euproserpinus Euterpe Edw., Ent. Amer. iv. 1888, p. 25.—"Allied to, and very probably confounded in collections with *E. Phœton* G. & R., but certainly distinct. Many examples of *Phœton* have at different times passed through my hands, though strangely enough, they have nearly all been ♀ ♀. Boisduval described *Macr. Erato* = *Phœton* from a ♀, and Grote and Robinson's type also belonged to that sex. I have one specimen of the ♂ [♀] in which the antennæ are without serrations, and distinctly thickened towards the extremity exactly as in *Hemaris* and *Macroglossa*, thus showing in this respect a close relation to those genera. In the ♀ [♂] of this species (*Phœton*) the antennæ are deeply and rather coarsely biserrate, and at the same time are gradually thickened towards the extremity. Another peculiarity of the species is the remarkably oblique exterior border of the lower wings, which carries a black marginal band of nearly equal width, not, however, reaching to the anal angle. In my collection is a form, which, though in its system of coloration exactly resembling *Phœton*, must from other characters be a distinct species, if not representing another genus. It is this which I propose to call *E. Euterpe.* In it the antennæ are of equal size throughout, the tip being furnished with a sharply curved hook. The serrations are very deep and long, and when viewed through a lens each joint ap-

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pears to be furnished with a series of bristles, as in some genera of *Ægeridæ*. The thorax and abdomen are densely clothed with long hair, the latter being very robust and much shorter than in *Phæton*, extending very little beyond the wings. The wings are broader than in the more familiar species, the primaries being entirely more rounded and not produced at the apex, while the secondaries instead of being oblique upon the margin, are very distinctly rounded, the apex being the opposite of acute. In color, there is great resemblance between the two forms, though in *Euterpe* the shading of the upper wing is brownish, while in *Phæton* it is black. In *Phæton* the basal line is geminate and slightly oblique, the outer of the double lines turning slightly toward the base on the costa. In *Euterpe* it is single, thick, slightly dentate on its outward edge, while behind it is a deep blackish brown shade reaching as far as the cell and there touching an ovate discal spot. In *Phæton* the space behind the basal line is grayish, mottled with black to a space about 2 mm. from the margin and the discal mark is linear and not ovate. Before reaching the rather broad black posterior margin there are 3 faint black lines from the internal margin which are obsolete before reaching the costa. The inner edge of the posterior margin is sinuate and very slightly irregular in its outline. In *Euterpe* the space behind the broad blackish basal shade is very distinctly gray, mottled with fawn color, and with a few scattered white scales. The inner edge of this gray space overreaches upon the broad black border in 3 very deep and distinct teeth, one on the internal angle, one in the middle and one reaching almost to the apex, thus differing in a remarkable manner from the form of the posterior border of *Phæton*. The fringes are also distinctly longer and bear more white in *Euterpe* than in the other species. The secondaries are, as I have said, more rounded on their margins, the black marginal band is broader than in *Phæton*, and is swollen in the middle of its inner edge, while in *Phæton* this edge is quite straight. The base of the lower wing in both species is black. In *Phæton* the disc is pale primrose yellow, this shade being nearly of the same width throughout. In *Euterpe* the disc is clear white, very broad on the costa, but abruptly narrowing, so that at the anal margin it is only one-fourth of the width on the costa. In *Phæton* the thorax is clothed with long gray hairs, while the abdomen, which is black in both sexes, bears on the sides of the 4th and 5th segments bunches of pale yellow hairs, which are also visible beneath. In *Euterpe* the clothing of thorax and abdo-

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men is blackish gray throughout, and there is no trace whatever of the yellow lateral patches. On the lower side the markings are repeated in both species, but in *Phœton* they are sharply and clearly defined, while in *Euterpe* they are confused and somewhat indistinct. The difference in shape of the discal mark of the primaries is very decidedly displayed on the lower side, and in *Euterpe* there is a distinct linear discal mark on the secondaries absent in *Phœton*. In *Euterpe* the hairy covering of the legs and lower side of the abdomen is blackish gray throughout, while in *Phœton* the clothing of the legs is yellowish white mixed with gray, and the abdomen is blue-black, with two faint white bands and a sparse covering of gray hairs. In *Phœton* the antennæ in both sexes are black throughout, but in *Euterpe* the shaft is clear white, with the serrations blackish brown.

"I have no doubt, whatever, of the distinctness of this lovely species, of which I have only seen the ♀ example from which the present description is taken. I have been careful to give a comparison between the two forms, though there can be no possibility, except at the first glance, of confounding them. In shape of wings, robust form of abdomen, and the structure of the antennæ, *Euterpe* approaches very closely to the little known *Arctonotus lucidus*.

"The unique example was captured near San Diego, Cal., by the late H. K. Morrison."

In response to my request Mr. Edwards kindly examined the tibial armature of his species for me, and writes: "I have carefully examined the tibial claws of my *Euproserpinus euterpe*, and though the general characters are the same, there is a little difference in detail. In the first place in *phœton* the posterior claws, i. e., those nearest the posterior base of the tibiæ are the longest, though all are of nearly equal length. In *euterpe* the largest are those near the junction of the tarsi. And in *euterpe* there are two claws to the tarsi, quite long, which I cannot discover in either of my specimens of *phœton*. The legs of *euterpe* appear to be altogether longer and more slender than those of *phœton*." The species seems altogether to be a distinct one, though quite possibly mixed with *phœton* in collections.

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List of the SPHINGIDÆ of Temperate North America.

Family SPHINGIDÆ.

Subfamily MACROGLOSSINÆ.

HEMARIS Dalm.

1. palpalis Grt.
2. thetis Bd.
   metathetis Butl.
3. rubens Edw.
   senta Strk.
4. cynoglossum Edw.
5. tenuis Grt.
   fumosa Strk.
6. diffinis Bd.
   fuciformis ‡ S. & A.
   æthra Strk.
7. axillaris G. & R.
   marginalis Grt.
   grotei Butl.
8. gracilis G. & R.
9. thysbe Fabr.
   pelasgus Cram.
   cimbiciformis Steph.
   etolus Bd.
   fuscicaudis Wlk.
   var. ruficaudis Kirby.
   uniformis G. & R.
   pyramus Bd.
   floridensis G. & R.
   var. buffaloensis G. & R.

LEPISESIA Grt.

10. flavofasciata Barnst.
11. ulalume Strk.
12. euterpe Edw.
13. phæton G. & R.
    errato Bd.
14. clarkiæ Bd.
    victoriæ Grt.
15. circæ Edw.
16. gauræ S. & A.
    var. juanita Strk.

Subfamily CHŒROCAMPINÆ.

ÆLLOPOS Hüb.

17. fadus Cram.
    titan Cram.
    annulosum Swains.
    balteata Kirtl.
18. tantalus Linn.
    tripunctata Goeze.
    zonata Dru.
    ixion Linn.

ENYO Hüb.

19. lugubris Linn.
    fegeus Cram.
    camertus Cram.
    luctuosus Bd.

AMPHION Hüb.

20. nessus Cram.

THYREUS Swains.

21. abbotii Swains.

DEIDAMIA Clem.

22. inscriptum Harr.

DEILEPHILA Ochs.

23. gallii Rott.
    var. chamænerii Harr.
    epilobii Harr.
    intermedia Kirby.
    canadensis Gn.
24. lineata Fabr.
    daucus Cram.
    oxybaphi Clem.

CHŒROCAMPA Dup.

25. tersa Linn.

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ARGEUS Hüb.

26. labruscæ Linn.
    clotho Fabr.

PACHYLIA Wlk.

27. ficus Linn.
    crameri Ménét.
    lyncea Clem.
    venezuelensis Schauf.

PHILAMPELUS Harr.

28. linnei G. & R.
    vitis ‡ Cram.
    fasciatus ‡ Grt.
29. vitis Linn.
    jussieuæ Hüb.
    fasciatus Sulz.
30. pandorus Hüb.
    satellitia ‡ Harr.
    ampelophaga Bd.
31. achemon Dru.
    crantor Cram.

AMPELOPHAGA Brem. & Gray.

32. chœrilus Cram.
    clorinda Martyn.
    azaleæ S. & A.
33. myron Cram.
    pampinatrix S. & A.
    var. cnotus Hüb.
34. versicolor Harr.

Subfamily SPHINGINÆ.

AMPHONYX Poey.

35. antæus Dru.
    jatrophæ Fabr.
    hydaspes Cram.
    medor Cram.

DILOPHONOTA Burm.

36. ello Linn.
37. obscura Fabr.
    stheno Hüb.
    rhœbus Bd.
38. merianæ Grt.
    omphaleæ Bd.
39. edwardsii Butl.
40. melancholica Grt.
41. festa Edw.

CAUTETHIA Grt.

42. grotei Edw.
    noctuiformis ‡ HS.

PROTOPARCE Burm.

43. celeus Burm.
    quinquemaculata Haw.
    carolina ‡ Don.
44. carolina Linn.
45. rustica Fabr.
    chionanthi S. & A.
46. *affinis* Goetze.
    convolvuli ‡ Dru.
    pungens Eschsch.
    druræi Don.
    var. decolorata Edw.

SPHINX Linn.

47. kalmiæ S. & A.
48. drupiferarum S. & A.
    var. utahensis Edw.
49. perelegans Edw.
50. gordius Cram.
    pœcila Steph.
51. luscitiosa Clem.
52. vancouverensis Edw.
    vashti Strk.
    var. albescens Tepper.
53. libocedrus Edw.
54. chersis Hüb.
    cinerea Harr.
    oreodaphne Edw.
55. insolita Lint.
56. pinastri Linn.
    saniptri Strk.
57. sequoiæ Bd.
    ♂ *coniferarum* ‡ Wlk.

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58. dollii Neum.
59. coloradus Smith.
60. elsa Strk.
61. canadensis Bd.
plota Strk.
62. lugens Wlk.
eremitoides Strk.
merops Bd.
andromedea Bd.
sordida ‡ Clem.
separatus Neum.
63. eremitus Hüb.
sordida Harr.
64. plebeius Fabr.
65. cupressi Bd.

DOLBA Wlk.

66. hylæus Dru.
prini S. & A.

CHLÆNOGRAMMA Smith.

67. jasminearum Bd.

CERATOMIA Harr.

68. amyntor Hüb.
quadricornis Harr.
69. undulosa Wlk.
brontes ‡ Bd.
repentinus Clem.
70. hageni Grt.
71. catalpæ Bd.

ELLEMA Clem.

72. harrisii Clem.
coniferarum ‡ Harr.
ab. bombycoides Wlk.
73. pineum Lint.
74. coniferarum S. & A.
cana Martyn.

EXEDRIUM Grt.

75. halicarniæ Strk.

Subfamily SMERINTHINÆ.

TRIPTOGON Brem.

76. modesta Harr.
princeps Wlk.
populicola Bd.
cablei von Reiz.
var. occidentalis Edw.
imperator Strk.

SMERINTHUS Latr.

77. geminatus Say.
var. jamaicensis Dru.
ocellatus Fabr.
78. cerysii Kirby.
form astarte Strk.
form ophthalmicus Bd.
var. pallidulus Edw.
var. vancouverensis Butl.

PAONIAS Hüb.

79. excæcatus S. & A.
pavonina Geyer.
80. myops S. & A.
rosacearum Bd.
jamaicensis ‡ Butl.
81. astylus Dru.
integerrima Harr.
io Bd.

CRESSONIA G. & R.

82. juglandis S. & A.
robinsonii Butl.
pallens Strk.

ARCTONOTUS Bd.

83. lucidus Bd.

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EXPLANATION OF PLATES.

PLATE IV.

1. **Hemaris thysbe**—*a*, supra-anal plate; *b*, side piece; *c*, clasper (*buffaloensis* shows an identical structure).
2. **Hemaris rubens**—*a*, supra-anal plate from side; *b*, same from below (*tenuis* does not differ).
3. **Pterogon clarkei**—supra-anal plate from side.
4. **Pterogon clarkei**—fore tibia, showing armature.
5. **Ællopos tantalus**—supra-anal plate from above.
6. **Ællopos tantalus**—supra-anal plate from below, showing the division of the plate which is invisible from above.
7. **Ællopos tantalus**—side piece, clasper and spinose penis sheath.

PLATE V.

1. **Enyo lugubris**—side piece.
2. **Enyo lugubris**—supra-anal plate from side.
3. **Amphion nessus**—supra-anal plate from side and above.
4. **Amphion nessus**—sheath of penis and the hooked tip of penis.
5. **Thyreus abbotii**—side piece and clasper.
6. **Thyreus abbotii**—supra-anal plate.
7. **Deilephila gallii**—supra anal plate.
8. **Deilephila gallii**—side piece and clasper.
9. **Deilephila lineata**—clasper (side piece as in *gallii*).

PLATE VI.

1. **Pachylia ficus**—supra anal plate from above.
2. **Pachylia ficus**—side piece and clasper.
3. **Philampelus pandorus**—supra-anal plate (this structure is similar in all species).
4. **Philampelus pandorus**—side piece and clasper (*linnei* is similar in this respect).
5. **Philampelus achemon**—side piece and clasper.
6. **Philampelus vitis**—clasper.
7. **Chœrocampa tersa**—side piece and clasper (supra-anal plate as in *Ampelophaga*).
8. **Ampelophaga chœrilus**—supra-anal plate (the other species are similar).
9. **Ampelophaga myron**—clasper.

PLATE VII.

1. **Ampelophaga chœrilus**—side piece and clasper.
2. **Ampelophaga versicolor**—side piece and clasper.
3. **Deidamia inscriptum**—side piece and clasper.
4. **Amphonyx anteus**—palpus.
5. **Cautethia grotei**—supra-anal plate from side.
6. **Cautethia grotei**—side piece and clasper.
7. **Dilophonota obscura**—supra-anal plate from above; the inferior plate is of the same shape, but the forks are smooth, slender and cylindrical.
8. **Dilophonota obscura**—side piece and clasper; *a*, clasper still more enlarged.

PLATE VIII.

1. **Dilophonota edwardsii**—upper supra-anal plate.
2. **Dilophonota edwardsii**—lower supra-anal plate.
3. **Dilophonota edwardsii**—side piece and clasper.
4. **Dilophonota merianæ**—upper supra-anal plate.
5. **Dilophonota merianæ**—lower supra-anal plate (the clasper is as in *D. ello*).
6. **Dilophonota ello**—side piece and clasper; the supra-anal plates are very similar to those of *D. obscura*.
7. **Protoparce celeus**—supra-anal plate (very similar in the other species).
8. **Protoparce celeus**—side piece and clasper.
9. **Protoparce cingulata**—side piece and clasper.

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PLATE IX.

1. **Protoparce carolina**—side piece and clasper.
2. **Protoparce rustica**—side piece and clasper.
3. **Sphinx drupiferarum**—supra anal plate (all the species are very similar in this respect).
4. **Sphinx drupiferarum**—side piece and clasper.
5. **Sphinx luscitiosa**—side piece and clasper.
6. **Sphinx chersis**—side piece and clasper.

PLATE X.

1. **Sphinx gordius**—side piece and clasper.
2. **Chlænogramma jasminearum**—side piece and clasper.
3. **Dolba hylæus**—supra anal plate.
4. **Dolba hylæus**—side piece and clasper.
5. **Ceratomia amyntor**—supra anal plate.
6. **Ceratomia amyntor**—side piece and clasper.
7. **Ceratomia undulosa**—supra anal plate.
8. **Ceratomia undulosa**—side piece and clasper.
9. **Ceratomia catalpæ**—supra anal plate.
10. **Ceratomia catalpæ**—side piece and clasper.

PLATE XI.

1. **Ceratomia amyntor**—fore leg, showing armature of fore tarsi.
2. **Ellema harrisii**—side piece and clasper.
3. **Triptogon modesta**—supra anal plate.
4. **Triptogon modesta**—side piece and clasper.
5. **Triptogon modesta**—antennal joints.
6. **Smerinthus ophthalmicus**—side piece and clasper.
7. **Smerinthus cerysii**—side piece and clasper.
8. **Smerinthus geminatus**—side piece and clasper.
9. **Paonias astylus**—side piece and clasper.
10. **Paonias excæcatus**—side piece and clasper.
11. **Smerinthus ophthalmicus**—antennal joints.

PLATE XII.

1. **Cressonia juglandis**—supra anal plate.
2. **Cressonia juglandis**—antennal joints.
3. **Cressonia juglandis**—side piece and clasper.
4. **Paonias myops**—side piece and clasper.
5. Venation of **Thyreus.**
6. " **Paonias.**
7. " **Smerinthus.**
8. " **Hemaris.**
9. Antennal joints of **Smerinthus cerysii.**
10. " " **Triptogon modesta.**

PLATE XIII.

1. Venation of **Cressonia.**
2. " **Pachylia**—**Philampelus** is similar.
3. " **Protoparce.**
4. " **Ællopos.**
5. " **Triptogon.**
6. " **Enyo.**

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DIPTERA BRASILIANA,

Ab H. H. SMITH Collecta.

Part I—STRATIOMYIDÆ, SYRPHIDÆ.

BY S. W. WILLISTON, M. D.

More than a year ago Mr. Herbert H. Smith, who is well known to zoologists for his writings on Brazil, placed in my hand for study a collection of Diptera made by him during the past few years in Southern Brazil. The collection is one of great importance, both on account of its size and excellent preservation. It is, I believe, the largest local collection that has ever been made, or at least studied, of South American Diptera. The labor in its determination is necessarily very great, and often tedious; a very large part of the species have never been recognized since Wiedemann's and Macquart's descriptions a half century ago, and with the exception of Philippi's, Schiner's and Lynch's publications, but little has been done since that time. I have endeavored faithfully to identify such of the species as have been previously described, but I trust that if I have occasionally made a synonym that I will be pardoned. Indeed, my chief desire has been to study and describe the species so that they will again be recognizable, and I do not by any means deem it necessary to give a new name to every species that appears new. In many genera good descriptions cannot be made without comparison with all, or nearly all the existing species of the fauna.

Not a few of the species appear to be of wide distribution, a fact that renders their recognition often more doubtful, and it is only by the study and comparisons of abundant material from local faunæ that the real facts in such cases will be determined. It may be of interest to note that most of the species described by Schiner, with the locality given simply as South American, seem to be at home in Southern Brazil.

Chapada is a small village in the vicinity of Cuyabá.

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STRATIOMYIDÆ.

Hylorus Philippi, Verh. zool.-bot. Gesellsch. xv. 728, 1868.

I have no specimen of this genus from South America, but one from New South Wales, of an undetermined species, agrees so fully with the description and figure given by Philippi that I have no hesitation in referring it to the same genus. *Metoponia* is certainly closely allied, indeed, to all appearances, quite the same. *Xenomorpha australis* Macq., if the figure is correct, belongs also in the same genus. The genus is closely allied to *Chiromyza*, yet sufficiently distinct in the furcation of the third vein. Bigot (Ann. Soc. Ent. Fr. 1879, 185) is wrong in uniting them, and it is probable that his *C. vicina*, if it is really from Australia, is a member of this genus, which I think should be known as *Metoponia*.

1. **Chiromyza** spp.

I have, of this genus, two males from Chapada, (Nov.) and four males and two females from Rio de Janeiro (April). There are certainly two, and perhaps three, species among them, but the existing descriptions do not enable me to decide which they are. The two specimens from Chapada differ from the other males in having a smaller head and more slender antennæ, which are distinctly constricted beyond the basal segment of the third joint. In all the other specimens the third joint tapers from base to tip, which is more acute. In one (*a*) of the two, however, the head is almost cordate in front view, the eyes are more closely contiguous, and the ocellar tubercle is more prominent; the mesonotum is more strongly gibbose in front, the hind tibiæ less slender and darker colored, and the second basal cell is not petiolate as in the other (*b*), though this last probably means little. Both measure about 6–7 mm. The legs in both are yellow, a little brownish in specimen *a*, especially on the tarsi. The males (*c*) from Rio de Janeiro, of about the same size, agree better among themselves, differing only in the depth of color on thorax and abdomen; the legs are yellow, in some the tarsi brownish, the antennæ are red, with the tip brownish; they may be *C. ochracea* Wied.

The two females are distinctly different from each other. In the one (*d*) the color is much darker than in the other (*e*), with the antennæ nearly black, the legs brown, the head is smaller, the front a little narrower, the ocellar tubercle much less prominent, the hind

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tibiæ straighter and less dilated, etc. The species are evidently all closely allied, and confusion in their discrimination will prevail till some better characters are applied than have been hitherto.

2. **Beris bellula** n. sp.

♂.—Length 7 mm. Mesonotum bronze black, scutellum green; antennæ short; wings blackish. Antennæ black, third joint red at the base, a little longer than the first two joints together. Face and frontal triangle silvery pruinose, the latter just above base of antennæ blackish. Proboscis yellow, tip of palpi black. Eyes thinly pilose. Mesonotum dark bronze, with dark fulvous, anteriorly blackish, pile. Scutellum bright shining metallic green, with six strong, nearly equal black spines. Pleuræ shining black, with white pile. Abdomen brownish black, along the middle broadly luteous (perhaps variable); venter mostly yellow. Legs yellow; a ring near the tip of the four front femora and the distal four tarsal joints of the same pairs, brownish; tip of hind femora broadly and the distal four joints of hind tarsi blackish. Wings blackish, the stigma but little darker.

. One specimen, Rio de Janeiro, August. Resembles *B. mexicana* Bell., but differs in color of face, thorax, wings, legs, etc., and in the non-dilated hind metatarsi.

3. **Beris pulchella** n. sp.

♂.—Length 6 mm. Mesonotum and scutellum bright shining green; antennæ elongate; wings blackish. Antennæ as long as the head, yellow or brownish yellow, the third joint blackish toward the tip. Face and front silvery pruinose, a blackish spot above the base of the antennæ. Tip of palpi black. Eyes thinly pilose. Mesonotum and scutellum bright metallic green, the former often with blue or violet reflections, pile fulvous, blackish in front. Pleuræ shining, greenish black, with white pile. Scutellum with six moderately strong black spines. Abdomen yellowish red in front and along the sides, the terminal segments black, on the middle of the disc brownish. Coxæ and femora reddish yellow; tibiæ wholly, front tarsi, tip of four posterior metatarsi, and the remaining joints black, the four posterior metatarsi otherwise nearly white. Wings blackish or brownish; the stigma only a little darker.

♀.—Front steel-blue. Abdomen brown or blackish throughout. Legs yellow, a small brownish ring on distal part of hind femora, and the distal half of hind tibiæ and all the tarsi except the metatarsi, black or brown.

Four males and one female, Chapada, November. The female specimen is not in good preservation.

4. **Hermetia illucens** Linné, Wiedemann, etc. [For the synonymy see Osten Sacken or Lynch, Catalogues].

Six specimens from Rio de Janeiro agree well in color and size with North American ones. As in those, only the hind tibiæ are yellow at the base. I would call attention to a sexual difference in the antennæ, which seems to occur frequently in this genus, namely,

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the greater dilatation of the third antennal joint in the female. The same feature occurs in *H. Comstockii* and *H. apicalis* at least. In *illucens* it is also more reddish in color, or even wholly red. In all my female specimens of this species, both North and South American, the yellow spots of the second abdominal segment are much smaller in extent, not reaching the hind margin as in the male. Three specimens from Chapada, both male and female, have the posterior part of the abdomen deep red, but I can discover no other differences.

5 **Hermetia albitarsis** Fabricius, Syst. Antl. 63; Wiedemann, Auss. Ins. ii, 25; Macquart, Dipt. Exot. Suppl. i, 49; Schiner, Novara Exped. 70.—S. America [Wied.], Columbia [Schiner, Macquart].

? *H. bimaculata* Macquart, Hist. Nat. Dipt. i.

? *H. sexmaculata* Macquart, Hist. Nat. Dipt. i.

H. planifrons Macquart, Dipt. Exot. Suppl. i, 50.—Yucatan.

Two specimens, Chapada. Length 11 mm. The flat, bright silvery front with a slender, median, black strip, is characteristic of this species. In one of my specimens the silvery tomentum reaches nearly to the ocelli, in the other, not two-thirds of the distance. In the latter specimen the base of the third antennal joint is reddish, the base of the tibiæ is not at all yellow, and the last two joints of all the tarsi are darker, on the hind pair blackish. In both, the ground color of the front has four small yellow spots near the orbit, two below the ocelli and two above the base of the antennæ. The eyes are pilose, and are marked, as in the two following, with an irregular four-sided purple stripe on a green ground.

6. **Hermetia apicalis** Wiedemann, Auss. Ins. ii, 25; Schiner, Novara Exped. 70.—S. America.

Two specimens, from Rio de Janeiro. Wiedemann's description applies well. The species resembles the foregoing, but the front is not plane and the wings and abdominal spots are different. The front has four small yellow spots, as in the foregoing, and the eyes are likewise pilose and similarly marked. The abdominal spots are of the same size in both sexes; in my male specimen yellow; in the other red. The third antennal joint is dilated in the female. *H. varipennis* Bigot must be a closely allied species.

7. **Hermetia ceriogaster** n. sp.

♂ ♀.—Length 14—16 mm. Black, abdomen coarctate at base, antennæ long, tarsi white, wings brown, eyes pilose. Antennæ black, slender, the lamellæ nearly twice as long as the preceding together, the third joint not dilated. Front black, shining, the median protuberance strong; pile black, not silvery

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pubescent. Face strongly projecting downwards; black, with a dirty white stripe in the middle, and a semi-oval, light yellow spot on each side below the antennæ; pile chiefly black. Eyes pilose. Mesonotum black, moderately shining, not distinctly vittate, on the posterior part broadly, but not conspicuously, yellow pubescent or tomentose. Abdomen strongly coarctate at base; black, with a purplish or bluish reflection, black pubescent; second segment more brownish, on its anterior, most coarctate, portion, two moderately large, oval, white translucent spots, on the venter the segment wholly so. Legs deep black; all the tarsi white, with the last two joints infuscated or blackish. Wings dark; along the anterior part with a reddish cast, broadly blackish at the end and behind, except that the anal cell chiefly, and a large part of the anal angle, are hyaline.

My two specimens seem to be male and female; in the one the base is less long petiolate than, but the apex rounded and with an appendage as, in *H. coarctata* Macq., as figured in his Dipt. Exot. Suppl. i, pl. v, fig. 4; in the other the tip is broader and the genitalia are concealed. From *H. coarctata* there are abundant differences. The eyes have the same pattern of markings as in the two preceding species and consisting of a purple stripe of quadrilateral figure, parallel to the inner, and outer upper, margins, with the other two sides deeply concave inwardly. This represents a fourth type of coloration in the genus, the other three of which have been described by Osten Sacken. As a warning against the attempt to base any divisional generic characters on the eye pilosity in Hermetia, I will mention that *H. lativentris* Bell. (or at least a closely allied species, see Can. Entom. xvii, 125) has the eye markings quite as Osten Sacken describes them in his closely allied *H. relicta*, though the eyes are not bare, but distinctly pilose.

8. **Chrysochlora** spp.

The South American species of *Chrysochlora*, or rather the species so named by authors, for the type, *C. amethystina*, from the Isle of France is hardly congeneric, are very difficult to discriminate and describe. They resemble each other very much and the coloration is variable; the descriptions hitherto published, based almost exclusively upon coloring, are, almost without exception, worthless. I have twelve specimens from Chapada and Rio de Janeiro, and scarcely any two are alike. The differences that I discover I endeavor to show in the following table:

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a.—Front and face narrow, of equal width, front nearly uniformly convex in profile.

b.—Front and face wholly yellow.

c.—Antennæ short, but little longer than the face; face and front with long, blackish pile; wings not conspicuously spotted. Two specimens, Rio.

cc.—Antennæ elongate, about half the length of the front; front and face not markedly pilose.

d.—Pleuræ and pectus wholly yellow; outer end of hind femora brown. One specimen, Rio.

dd.—Pleuræ with a black spot, pectus yellow; hind femora wholly reddish yellow. One specimen, Rio.

ddd.—Pleuræ with large black spot, pectus broadly black. Three specimens, Rio.

bb.—Front with a brown stripe, otherwise like *ddd*. One specimen, Rio.

aa.—Face rather broad above, the sides gently divergent to oral margin; front distinctly concave on lower two-thirds, and with a broad black stripe not reaching the antennæ; median dorsal stripe deep black to prothorax; wings broader, the stigmatic and distal infuscations more pronounced, and all the veins on the posterior border clouded. Four specimens, Chapada.

Accepting Macquart's determination, we may call the short antennæd specimen *C. vespertilio*, and the specimens from Chapada, with the frontal stripe, and the frontal gibbosity above, *C. castanea* Macquart, but these are only guesses. I have seen specimens very closely allied, from Tehuantepec, and Bigot has described also a species that cannot be distinguished, from the West Indies. It is probable that the species have a wide distribution. To name new species in such genera, without the study of considerable material, or at least without pointing out differences from the previously described ones, is highly reprehensible.

9. **Cacosis nigra** Wiedemann, Auss. Ins. ii. 28 (*Sargus*); Walker, Dipt. Saund. pl. iii, fig. 1; Schiner, Novara Exped. 67.—Brazil.

One specimen, Rio de Janeiro, November. Wiedemann's description applies excellently well, except as corrected by Schiner.

10. **Ptecticus affinis** Schiner, Novara Exped. 65.—S. America.

Five specimens, Chapada, November, December. The fifth segment has a narrow, black, or blackish transverse spot, and I see no transverse "Bändchen" on the front; otherwise the specimens agree with the description.

11. **Sargus thoracicus** Macquart, Hist. Nat. Dipt. i, 260.—S. America.

One specimen, Chapada. This specimen I should have referred to *S. concinnus* O. S., described from a male specimen from Mexico and

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a female from Brazil, except for the statement appended to his description that the eyes of his male specimen are not contiguous; in my specimen they are broadly and closely contiguous. There are, however, some other differences from the description. There is not the slightest trace of any yellow hind margin to the 3–6 abdominal segments; the second segment is wholly pale yellow, except a narrow, equal lateral margin, and a slender median brown stripe, and the first segment is only a little yellow in the middle. Nevertheless, the species must be very closely allied, and, if *S. concinnus* occurs in Brazil, there may be a question as to which of the two is the real *thoracicus* of Macquart.

12. **Sargus coarctatus** Macquart, Dipt. Exot. i, 1, 263, pl. xxv, fig. 2.—Brazil, Chili.

Two specimens from Corumbá (May), and Rio Parana, near Bella Vista (Dec.), both females, agree fairly well with the description. The wings are only lightly grayish, not brownish. Only the hind legs are black, with the metatarsi (except the narrow tip) white; a small yellow ring and the narrow base of the tibiæ yellow. I can find no other description that will apply well; *S. Sallei* Bell., seems the nearest, though the tarsi are different, and, if I understand the description rightly, the species is not a *Sargus*. However, as regards the related species, compare Osten Sacken, Biol. Centr.-Americana, Diptera, p. 23.

13. **Merosargus gracilis** n. sp.

♀.—Length 6 mm. Front broad, with a small median tubercle, and two white spots below; mesonotum and scutellum metallic blue; abdomen blackish brown. Front broad, metallic blue, in the middle with a small tubercle; below, the usual gibbosity well pronounced, the middle of which is brownish, separating two large white spots. Antennæ brownish or luteous yellow, the third joint lighter; arista black, considerably thickened and hairy at base. Mesonotum and scutellum bright metallic blue, with purplish reflections; a slender white line from the humeri to base of wings. Pleuræ black, with a yellowish spot below the wings. Abdomen blackish or reddish brown, with purplish reflections. Front coxæ and legs yellow; middle legs yellow with brownish on the outer part of femora and inner part of tibiæ; hind legs blackish brown, the immediate base of femora, the base of the tibiæ, and the three basal joints of the tarsi light yellow. Wings only lightly tinged with gray; second vein as in the following.

One specimen, Chapada. The species is closely allied, evidently, with *M. bituberculatus* Schiner, but the difference in the coloration of the thorax and the size (13 mm.), will readily separate them.

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14. **Merosargus festiva** n. sp.

♂ ♀.—Length 7 mm. Front with two white spots below; mesonotum black, red on the sides; pleuræ yellow; hind tibiæ brown. Front black, shining, of equal width in both sexes; above base of antennæ lightly swollen, with a small white spot on each side near the orbit. Antennæ reddish yellow, inserted on yellow ground; third joint subquadrate; arista black, moderately swollen and pubescent at base. Face on lower part blackish. Mesonotum black, but little shining, thinly golden pubescent, the sides and front red. Pleuræ yellow, more reddish above; metanotum shining black; scutellum black. Abdomen black, with a slight purplish or bluish lustre; first segment and the small contiguous angles of all the segments yellow; in the male specimen the hind margin of the second and third segments are rather broadly red in the middle; in the other the third only is narrowly red behind. Legs yellow; the last three joints of all the tarsi are brownish or brown, and the hind tibiæ brown, except the immediate tip; in the male the hind tibiæ strongly bent near the middle. Wings tinged with brownish, the stigma brown; the second vein arises from near the cross-vein.

Two specimens, Rio de Janeiro, December. The abdomen increases gradually in width to near the tip.

15. **Dicranophora astuta** n. sp.

♀ ♂.—Length 8 mm. Yellow [or light green?]; a black spot on the front, and thorax with black spots and stripes; legs reddish and brownish, base of hind tarsi white; scutellar spines small; legs simple. Head wholly yellow, except a black spot in the middle of the front, and the middle part of the occiput. Mesonotum black, not shining; two slender yellow stripes, reaching from a dilatation contiguous with the yellow humeri nearly to scutellum, a triangular spot in front of the suture at the side, and another, larger, triangular spot on the post-alar callosities, likewise yellow. Pleuræ yellow; two spots below the wings, an vertical spot on the mesopleuræ and a smaller one in front, black. Pectus with two black spots or stripes between the front and middle coxæ, separated by a yellow space; metanotum black, the yellow sides with a tubercular projection. Scutellum yellow; the process nearly vertical (about as long as the body of the scutellum itself), reddish brown; spines small. Abdomen red, with a yellow margin, the first segment yellow and a small triangular, posterior, median, yellow spot on the second and third segments. Legs without projections in the female; in the male the middle femora with a four or five toothed process below at the basal third, the middle tibiæ straight and simple. Femora reddish yellow; tarsi red or brownish red; front tarsi black or dark brown, metatarsi and base of second joint of four posterior tarsi yellowish white, the remaining joints brown. Wings nearly hyaline.

I have endeavored to identify this species with *D. picta* Macq. (Hist. Nat. Dipt. i, 255; Dipt. Exot. i, 1, 196, pl. xxiv, fig. 1), but the very unsatisfactory and incomplete description shows such positive differences that the identity seems wholly improbable. I would call attention to the large spot in front of the suture, yellow scutellum, red abdomen, middle tibiæ, white metatarsi, etc., as either different from, or wholly unnoticed in his descriptions.

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16. **Dicranophora affinis** n. sp.

♀.—Length 8 mm. Chiefly black; scutellar process not longer than the body of scutellum, the spines long, femoral projections confined to the outer end of the middle pair. Antennæ yellow; face nearly white; front black, shining, a slender yellow margin on each side, interrupted near the middle; below the middle a transverse depression. Mesonotum black, not at all shining; two slender stripes, abbreviated behind, reaching from a spot on the humeri and a small spot on the post-alar callosities green. Scutellum green, its process and spines red; the spines about as long as the entire scutellum. Pleuræ black, a slender vertical strip behind the prothorax, another, broader, near the mesopleural suture running into a large spot on the sternopleuræ; a spot on the side of metanotum, in which there is a tubercular projection, and one below it on the metasternum, green. Abdomen black; first segment with a subquadrate spot, which has a sharp anterior lateral projection, second segment with a small semi-oval spot behind, the third and fourth with the lateral margin, and the fifth at the tip with an oval spot, green. Coxæ pale yellow, femora yellowish red, yellowish at base; front tibiæ and tarsi black, hind tibiæ brownish red, four hind tarsi white, with the last two joints black; middle femora on the outer half below beveled, and near the middle of the straight beveling with about three small tubercles or teeth. Wings nearly hyaline, veins in front yellowish, stigma small, brownish.

One specimen, Rio de Janeiro. This species is related to *D. furcifera* Auss. Zw. Ins. ii, 38 (*Sargus*), pl. vii, fig. 5, but differs in the length of the scutellar process, the markings of front and abdomen, and, according to Macquart, Dipt. Exot. i, 1, 196, the position of the tubercles of the middle femora.

17. **Histiodroma inermis** Wiedemann, Auss. Zw. Ins. ii, 31 (*Sargus*), pl. vii, fig. 7; Schiner, Nov. Exped. 70.

One specimen, Rio de Janeiro. The description applies well.

18. **Rhaphiocera armata** Wiedemann, Auss. Zw. Ins. i, 1; ii, 29 (*Sargus*); Macquart, Dipt. Exot. i, 1, pl. xxiv, fig. 2; Schiner, Novara Exped. 70.

Ten specimens from Chapada. Schiner's remarks apply to these specimens, except of the posterior orbits, which have a spot above as Wiedemann described them; the spots, however, are variable in size.

19. **Hoplistes hortulanus** Wiedemann, Auss. Zw. Ins. ii (*Sargus*); Schiner, Novara Exped. 70.

Five specimens, Rio de Janeiro. The genus is very doubtfully distinct from *Rhaphiocera*.

20. **Chrysonotus aualis** n. sp.

♂.—Length 11 mm. Reddish yellow; front, tip of abdomen, hind tibiæ and tarsi, deep black. In habitus, *Ptecticus*-like, but the second antennal joint not prolonged and neuration different. Vertical triangle shining black; eyes nearly

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contiguous above the large light yellow supra-antennal gibbosity. Antennæ brownish red, the third joint transversely suboval; arista scarcely at all thickened at base. Mesonotum more reddish than elsewhere, shining; the remainder of the body nearly uniform reddish yellow, except the larger part of the fourth abdominal segment, and the fifth and sixth wholly deep shining black, the distal end of hind femora, the hind tibiæ, and hind tarsi wholly deep opaque black. Hind femora rather stout. Wings hyaline; from beyond the discal cell very distinctly tinged with blackish; stigma elongate, brown; origin of second vein remote from small cross-vein.

One specimen, Chapada. Notwithstanding the stoutness of the femora, I do not place this species under *Merosargus*. The arista shows scarcely any thickening, and the second vein of the wing is much more remote from the cross-vein than is found either in *Merosargus* or *Plecticus*.

21. **Euryneura nasica** n. sp.

♂.—Length 4 mm. Black; face conically produced downward; antennæ slender; wings brown, with a whitish cross-band bent outwards in the middle. Face and frontal triangle black, white pubescent. Antennæ not stout, brownish yellow, the style slender, white. Face conically produced downward, longer than the frontal triangle. Mesonotum and scutellum black, covered with fine golden tomentum; margin of scutellum yellowish red, the spines long, yellow, with black tip. Pleuræ with silvery white pubescence or pile. Abdomen elongate oval, flattened, wholly black. Wings brown, the immediate base hyaline; a conspicuous white cross-band runs from the front margin just beyond the second vein to the posterior margin at the tip of the fourth posterior cell, in its middle portion strongly bent outward, V-shaped. The wings are more slender, the second vein and the anterior branch of the third vein more oblique than in the following species. Legs yellow, with the markings similar in pattern to those of the following species, the middle legs being but slightly infuscated, the front tibiæ and tarsi brown.

One specimen, Chapada.

22. **Euryneura elegans** n. sp.

♀.—Length 4 mm. Black; front, thorax and margin of abdomen light golden tomentose; scutellar spines small; wings variegated. Black; front opaque, sparsely, nearly uniformly golden tomentose, on the lower orbital margin with a narrow silvery border. Face very short, not produced, silvery pubescent. Antennæ black, the third joint with a reddish cast, in length only a little more than twice its width. Thorax covered with fine golden tomentum, which on the sides is arranged to form indefinite slender stripes; mesonotum with two slender bare stripes, nearly contiguous in front, thence gradually diverging to end near the spines of the scutellum. Abdomen broad, flat, its margin rather broadly, nearly silvery whitish, tomentose. Front femora, at the base below, broadly red; middle and hind femora reddish yellow, black at the tip above; front tibiæ and tarsi wholly black; middle and hind tibiæ black, with a median yellow ring; middle and hind tarsi yellow, with the last two or three joints black. The whitish cross-band of the wings begins at the front border, behind the second

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vein and goes nearly straight to the tip of the fourth posterior cell; beyond the band the wing is clouded with brown, with a small, darker cloud on the anterior branch of the third vein; with the exception of a cloud on the sixth vein and the posterior part of the anal angle, the basal portion of the wing is hyaline; between this basal hyaline portion and the cross-band the wing is broadly clouded, especially in front; in the stigma there is a large yellow spot; in the fifth posterior a white spot, and another, elongate one in the outer part of the first basal and in the discal cells.

This species is closely allied to *E. fascipennis* Wied., but the description, as completed by Schiner, shows such differences that the species is surely not the same.

23. **Promerisana nasuta** Macquart, Dipt. Exot. Suppl. iv, 47, pl. iii, fig. 4 (*Odontomyia*).

One male and two female specimens agree so well with Macquart's description and figures that I have no hesitation in referring them to his species, though described from Chili. The third joint of the antennæ is longer and more slender, the first joint less dilated than he figures them; the dorsum of the female abdomen, also, has not three, but four green stripes, separated by three brown ones.

The structural characters, as given by Walker, of his genus *Promerisana* agree so well with those of these specimens that there can be scarcely a doubt of their correct location here, though neither of the species that I know can be identified with the type. The genus differs from *Odontomyia*, more especially, only in the structure of the head and the antennæ, but this I believe is sufficient, Gerstaecker to the contrary, notwithstanding. In *P. nasuta* the abdomen is longer and flatter than is usual in species of *Odontomyia*. The peculiar structure of the head is sufficiently well shown in Macquart's figures. *P. vittata* Walker, seems, from the description, to have a more dilated first antennal joint, but this dilatation is not of generic value, as is evidenced by the following new species.

The tendency to facial or frontal projections seems to be great in the South American Stratiomyinæ; besides *Rhingiopsis*, *Stratiomys conica* Wied., *Odontomyia fasciata* Macq., *O. heteroneura* Macq., *O. pachycephala* Schiner, and *O. pachyceps* Bigot,—all apparently have a facial or frontal projection of one kind or another.

24. **Promerisana cylindricornis** n. sp.

♂.—Length 12 mm. Black; abdomen with four yellow spots; face convex below antennæ; first joint of antennæ cylindrical. Facial projection strongly convex below insertion of antennæ, less conical than in *P. nasuta*, the lower border more nearly parallel with the upper, the whole projection shining black, the

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oral margin, the cheeks, and the posterior orbits green. First joint of antennæ three or four times as long as the short second joint, cylindrical, red, with black hair; third joint black, long, slender, sulcate, the terminal [fifth?] not differentiated. Mesonotum black, with yellow pile, the post-alar callosities and broad margin of scutellum yellow [or green]. Pleuræ with a large, arcuated, yellow spot in front, and several confluent ones behind below. Spines of scutellum small, approximate. Abdomen flattened, opaque black; the second and third segments each with a yellow spot on each side behind, not reaching the third of the way across; narrow margin of the shining fifth segment yellow. Legs brownish black. Wings uniformly and lightly tinged with brownish; veins approximate anteriorly, the minuti anterior branch of third vein present.

One specimen, Chapada. Another male specimen with this, possibly of the same species, has the facial convexity a little less strong, red or green on the under part; two slender vittulæ on the mesonotum and the lateral margin of the same, yellow or green. The pleuræ are almost wholly light green, the pectus black. The abdomen has the first pair of spots much larger and convex anteriorly, the second pair obscure, the abdomen more reddish behind. The legs are brownish red, not brownish black.

25. **Melanochroa dubia** Roeder, Entom. Nachr. xii. 140.—Brazil.

A single specimen from Rio dê Janeiro agrees well with Roeder's description, except that the distal half or two-fifths of the middle tibiæ are yellow. The legs are marked precisely as they are in *Myxosargus fasciatus* Brauer (or a species that I identify as such from North Carolina), that is, deep black, except the distal half of the middle tibiæ and the first two joints of all the tarsi. The non-contiguity of the male eyes and the aristiform termination of the antennæ are the only generic differences between these two species, which otherwise resemble each other very much. The prolongation of the face downwards in *Myxosargus* is hardly of generic value, as precisely the same difference occurs between the two related species of *Euryneura* described above.

26. **Myxosargus Braueri** n. sp.

♀.—Length 6 mm. Quite like *M. fasciatus* Brauer, except that the front has a single, median, rather strong tubercle, the distal margin of the scutellum is yellowish white and the legs are much more yellow, as follows: femora, except the tip, black; tibiæ, except a median brown or brownish ring, yellow; tarsi yellow, with the distal two or three joints brownish.

This species is a very interesting addition. The structure throughout, except, perhaps, the posterior orbits, as well as the coloration of head, thorax, abdomen and wings, agrees fully with a male of *M. fasciatus* Brauer, from North Carolina. Brauer describes the poste-

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rior orbits as somewhat swollen. In my male specimen they are but very little so. In this female the posterior orbits are peculiarly enlarged and thinned, so as to fit over the front margin of the thorax.

Altogether, this species, a true *Myxosargus*, and though closely allied to the type species, is, I believe, entitled to a name, which I choose in honor of the talented author of the genus. The wings have the same pattern of coloration as in *fasciatus*, but the markings are darker than in my specimen of that species. Three specimens, Chapada.

27. **Chordonota nigra** n. sp.

♂.—Length 5½ mm. Black; antennæ red, tarsi luteous yellow; wings subhyaline, stigma pale yellow. Eyes pilose, broadly contiguous, on upper half the facets enlarged, the area sharply distinguished from that of the lower facets. Frontal triangle very small, white pubescent, as is also the upper part of the face. Antennæ deep red, the extreme tip only brownish. Mesonotum shining, with two remote, in the middle obsolete or wanting, white pubescent stripes, appearing (in my specimen at least) as four spots, two of which are situated on the front margin, the others in front of the scutellum. Scutellum with longer black pile. Abdomen flat, nearly circular in outline, but little shining; third and fourth segments on the anterior angles with a silvery pubescent spot; on the fifth wholly so pubescent, except in the middle. Legs black, tarsi luteous yellow.

One specimen, Chapada. The eyes occupy nearly all the head; there is no orbital margin behind visible from the side.

28. **Rhingiopsis tau** Roeder, Ent. Nachr. xii, 138.

A female specimen from Rio de Janeiro (October) agrees excellently well with the author's description of this species. The genus is a good one, and quite distinct from *Promerisana* Walker.

29. **Rhingiopsis rostrata** Wiedemann, Auss. Ins. ii, 68 (*Stratiomys*); Macquart, Dipt. i, 249; Dipt. Exot. i, 1, 186, pl. xxii, figs. 4*a* 4*b* (*Odontomyia*).—Brazil.

A male specimen from Chapada I refer to this species, as it agrees well with Wiedemann's description of the female, the only differences being sexual. Macquart's figure, though somewhat of a caricature, will serve to show the general structure of the head. The species agree closely, and, had I not recognized the species in *R. rostrata* Wied., I should have, hesitatingly, referred my male specimen to the female of *R. tau*. As, however, Wiedemann's female agrees quite in the abdominal markings with my male specimen (and Macquart's also), I think there can be no question of the distinctness of the species, the more so, as aside from the very distinct abdominal markings, the scutellum of *R. tau* is wholly black, with stouter black

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spines, which have a distinctly more upward curvature. The antennæ are not as Macquart figures them, but quite as Roeder describes them, and quite alike in both species. Gerstaecker's specimens seem to be of a different species.

30. **Stratiomyia mutabilis** Fabricius, Ent. Syst. iv, 266; Syst. Antl. 81; Wiedemann, Auss. Ins. ii, 63, pl. iv, fig. 6; Perty, Delectus, etc., 184, pl. xxxvi, fig. 14; Walker, List etc., v, 42, 61; Gerstaecker, Linn. Ent xi, 321; Bellardi, Saggio, etc., i, 30; Schiner, Novara Exped. 61; Osten Sacken, Biol. Centr.-Amer. 37.—Mexico, Central America, Brazil.

Stratiomys fasciata Fabricius, Ent. Syst. iv, 266; Syst. Antl. 81 (male).

Acrochæta Aleus Walker, List, etc., iii, 526; v, 41 (*Stratiomys*).

Stratiomys subalba Walker, List, etc., v, 41, 43.

? *Stratiomys subalba* (Walker) Bellardi, Saggio, etc., i, 31; Osten Sacken, Biol. Centr.-Amer. 37.

Three female and one male specimen from Corumbá, collected in May, and as many of each sex from Chapada. The females from Corumbá all agree in having a narrow stripe on the hind margin of the third segment and an equal band, somewhat differing in width on the fourth. In those from Chapada that on the third is wanting, or feebly indicated near the sides, and the one on the fourth is broader. In the male from Corumbá the wings are marked as in all the females and the scutellum is margined with yellow. The male from Chapada, however, has the general color deeper black, the scutellum is wholly black, and the wings are almost uniformly dark brown in front, distinctly darker than in the others. This male I certainly believe is of the same species, and I feel equally confident that it is Walker's *subalba*. If I understand Osten Sacken's remarks aright, the male specimen that he refers to *mutabilis* has the abdomen marked as in the females; in my males the two yellow bands of the abdomen are extremely slender, and narrowly interrupted in the middle.

31. **Odontomyia** sp.

There are two specimens of a species of *Odontomyia* (♂ and ♀) which I have not succeeded in identifying with any described species. They are yellow, with the abdomen marked with a slender black stripe, the female mesonotum with three black stripes, the middle one suddenly narrowed behind the suture; in the male the whole dorsum is black, with the lateral margins yellow. This is another genus where he who describes isolated specimens without comparisons with allied species, and the study of considerable local material, is doing a positive injury.

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32. **Blastocera speciosa** Gerstaecker, Linn. Ent. xi. 342.—Brazil.

Two specimens from Chapada. The dorsal stripes do not agree quite with the description, nevertheless the identification is not doubtful.

33. **Panaeris lucida** Gerstaecker, Linn. Ent. xi. 347.--Cayenne.

One specimen, Chapada.

34. **Cyphomyia auriflamma** Wiedemann, Zool. Mag. iii, 54; Anal. Ent. 13; Auss. Ins. ii, 54; Gerstaecker, Linn. Ent. xi, 276.—Brazil.

Numerous specimens, Chapada.

35. **Cyphomyia** spp.

Two other species with the last, with abdominal spots, I cannot identify with any known species.

SYRPHIDÆ.

1. **Mixogaster conopsoides** Macq.

Twelve specimens from Corumbá, and one from Rio de Janeiro. Macquart's description does not apply very well, but the species I believe to be his. The male front is broad as in the female. In the female specimen from Rio de Janeiro the second segment of the abdomen is more slender, and the last section of the fourth vein is sinuous, not broken, and without stumps.

2. **Microdon splendens** Wied.

Two female specimens from Chapada agree pretty well with the description; the color of the abdomen shows scarcely any steel-blue. The first antennal joint is largely red at the base; the spines of the scutellum are remote, and there is no yellow at the tip of the abdomen.

3. **Microdon mirabilis** n. sp.

♀.—Length 15 mm. Black, but little shining; third joint of antennæ large; scutellum without points; wings yellow and black. Head black; face and cheeks with white pile; front with black pile; third joint of antennæ broad, longer than the slender first joint; second joint very short. Mesonotum but very little shining, nearly bare; humeri, post-alar callosities and the pleuræ deep reddish black. Scutellum small, oval, wholly without spines or emargination, bare. Abdomen bluish black, a little shining, bare, broader than the thorax on the second segment, thence tapering regularly to the apex. Legs pitchy black, the four front femora and tarsi largely deep red; hind metatarsi cylindrical. Wings yel-

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low and black; the margin of the yellow runs obliquely inwards from the tip of the auxiliary vein to the base of the anal angle, connected through the subcostal cell with a broad band reaching as far as the end of the first vein and terminating on the posterior side of the fourth vein in the second posterior cell; the black is of a deeper color in front, between the yellow.

♂.—Third joint of antennæ narrower; front only a little constricted. Abdomen, except the base and hypopygium, red. Wings black, with a narrow yellow band from the tip of the first vein nearly through the first posterior cell.

Two specimen, Chapada.

4. **Microdon inermis** n. sp.

♂.—Length 8 mm. Black, with green and violet reflections; scutellum without spines; fourth abdominal segment golden tomentose; hypopygium yellow. Face shining green, white pilose; in profile not gibbose below; rather narrow. First two joints of antennæ reddish brown, the third wanting. Front black, with slight purplish reflections and black pile; constricted in the middle so that its least width is less than half the distance from the foremost ocellus to the base of the antennæ. Mesonotum deep black, opaque, with inconspicuous purplish or coppery reflections, bare. Scutellum more distinctly coppery purple, rounded, without spines, and with a scarcely noticeable emargination. Abdomen bare, deep black, with faint green and purple reflections; fourth segment as long as the two preceding together, on the posterior two-thirds or more shining yellowish green, thickly covered with light orange yellow pile or tomentum; hypopygium yellow. Legs black, the tibiæ in part, and all the tarsi deep brownish red; hind metatarsi not wider than the succeeding joints. Wings nearly uniformly tinged with blackish.

One specimen, Entre Rios, September. The species is evidently closest allied to *M. violaceus* Macq., but is at once distinguished by the fourth abdominal segment.

5. **Microdon ? cyaneiventris** Macq.

♀.—Length 11 mm. Deep steel-blue with purple and coppery reflections; scutellum with spines; face with yellowish white pile. Face shining green, in profile parallel with the margin of the eyes. Front deep blue-black, with coppery reflections and some black pile above. Antennæ black; third joint a little longer than the first, cylindrical. Mesonotum resplendent coppery purple blue black, nearly bare. Scutellum strongly purple, with two remote spiniferous tubercles, bare. Abdomen deep steel blue, with purple reflections; the anterior angles of the third, fourth and fifth segments with fine white pubescence. Legs black. Wings nearly uniformly brownish.

Two specimens, Chapada. It is possible, though not very probable, that this is *M. cyaneiventris*, but the difficulty of distinguishing these allied species when the differences are not pointed out, renders their naming always a more or less doubtful procedure.

6. **Microdon** sp.

Not unlike the species described by me as *M. aurifex* Wied. (but doubtfully the same—Synopsis of the N. A. Syrphidæ, p. 9), except

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that the tibiæ and tarsi are yellow. The description, with that exception, applies (I do not possess the described specimen).

The genus *Microdon* I have found the most difficult one in the family, so far as identifications go. There seems to be considerable variation in not a few species, and, in the descriptions hitherto, almost none of the numerous structural characters have been made use of.

7. **Nausigaster punctulata** Williston, Synopsis N. A. Syrphidæ, p. 21.—United States, Mexico.

Three specimens from Chapada agree with the one mentioned by me from Tehuantepec. Whether they belong to a distinct species or not I cannot say.

TRICHOPSOMYIA gen. nov.

Small, wholly black, shining or opaque, moderately pilose species. Antennæ elongate, slender; first two joints of nearly equal length, third longer than the first two together; arista basal, small, bare. Face broad, pilose, with an obtuse tubercle, the epistoma receding. Frontal triangle of male large, broad, flattened, swollen on upper part; eyes in male narrowly, but closely contiguous, the ocellar tubercle prominent. Front in female broad, moderately narrowed above; the upper margin of head tumid and projecting. Scutellum triangular. Abdomen elongate oval. Legs of moderate strength; tarsi short, especially the front pair; metatarsi of front and hind pairs thickened, the remaining joints flattened; hind femora elongate and more or less thickened, the hind tibiæ arcuate and dilated; all the femora and tibiæ ciliate, of the hind legs conspicuously so. Wings as in *Pipiza* (*Pipizella*): posterior cross-vein rectangular, straight, last section of fourth vein bent or angulated. Eyes irregularly pilose.

This genus is allied to *Pipizella*, but will be at once distinguished by the vertex in the female and the frontal triangle in the male. The irregularly pilose eyes, with bare patches, will also serve to distinguish them. The neuration in all the species described below agrees closely, and is very like that of *P. pulchella* Will.—Synopsis N. A. Syrphidæ, pl. ii, fig. 1. The species resemble each other much in color markings; the following description will apply to the known species:

Face and front shining black, clothed with sparse long white pubescence or pile, which has a flattened or curled appearance; on the uppermost swollen part

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of the frontal triangle the color is opaque, and is clothed with straight, black pile; in both sexes the ocelli and vertex have black pile; post-orbital cilia white. Across the front part of the thorax, descending on the pleuræ, there is a band of yellowish or white pile, like that of the face. Legs black, the knees reddish; the first two or three joints of all the tarsi, except the hind metatarsi, light yellow. Antennæ red at base, the third joint brownish or brown.

8. **Trichopsomyia polita** n. sp.

♂.—Length 7 mm. Mesonotum opaque black; on the side, behind, and the scutellum metallic bronze black; pile black. Abdomen narrow, elongate, deep opaque black; the first segment, the narrow lateral margin of the second and the third, except a large basal triangle, and hypopygium, shining metallic bronze black. Hind femora considerably swollen, but not clubbed; hind tibiæ moderately dilated; middle femora of the male with a stout tooth below in the middle. Wings lightly infuscated; stigma brown.

♀.—Front wholly smooth and shining metallic greenish black, a small white spot near the orbit above; ocellar tubercle but little projecting. Mesonotum and scutellum wholly shining bronze black, the sides and posterior part white pubescent. Abdomen oval, wholly moderately shining greenish black, the sides and posterior part white pubescent. Middle tibiæ without tooth-like projection. Wings cinereous hyaline, the stigma pale yellow.

Two specimens, Chapada. Will be distinguished in the male by the tooth-like projection of the middle femora; in the female by the smooth front.

9. **Trichopsomyia puella** n. sp.

♂.—Length 6 mm. Ocellar tubercle strongly projecting. Mesonotum shining black, on the disc in front broadly opaque; pile long, mostly black. Hind femora moderately thickened at tip, slender on the basal three-fourths; hind tibiæ extraordinarily thickened and dilated, densely black pilose behind. Abdomen opaque black, the first segment slender, hind margin of second, a large triangle on each side of third, the fourth, except a large basal triangle, and the small hypopygium, coppery or metallic black. Wings brown; on the posterior part, and a cross band before the tip, subhyaline.

♀.—Front above only a little irregular, without distinct swellings. Abdomen wholly shining.

Four females and one male. Another male differs in having the abdomen narrower, the second and third segments largely yellow pubescent, and with yellow pile mingled with the black of the thorax. The female agrees with the last-mentioned male in the pubescence and pile, and the more elongate abdomen.

10. **Trichopsomyia tuberculata** n. sp.

♀.—Length 6 mm. Differs from the females of both the preceding species in having on the upper part of the front, below the ocelli, two prominent rounded tubercles forming with the prominent ocellar tubercle, an equilateral triangle; in having a black opaque cross band on the middle of the mesonotum, and in

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the wings being brown on the anterior two-thirds, the distal part nearly hyaline, without the apical spot of *T. puella*. The hind femora are a little stouter than in the last-named species, the tibiæ less thickened.

One specimen, Chapada.

11. **Trichopsomyia longicornis** n. sp.

♀.—Length 8 mm. Antennæ slender, distinctly longer than the face. Facial tubercle large, rounded, deeply concave above and below it. Ocellar tubercle prominent, the front above uneven, but without distinct tubercles or ridges. Across the middle of the mesonotum a less shining, or subopaque band. Abdomen moderately shining metallic, clothed with fine yellow pubescence; the hind margin of the second and third segments subopaque black. Hind femora moderately thickened, the thickening greatest on distal half. Hind tibiæ strongly dilated and thickened, less so than in *tuberculata* and *puella*, more so than in *polita*. Wings cinereous hyaline, yellow at base, near the middle in front with a large yellowish brown spot.

From *polita*, it will be distinguished by the smooth front and the strongly dilated hind tibiæ; from *tuberculata*, by the front; from all, by the longer antennæ, wings, size, etc.

One specimen, Chapada.

12. **Lepidostola pulchra** n. sp.

♂ ♀.—Length 4.5 mm. Mesonotum with three bright yellow tomentose bands; fourth abdominal segment wholly shining.

♂. Antennæ reddish yellow, the third joint brownish or brown; longer than the face, slender, first two joints of nearly equal length, third a half longer than the first two together. Face in profile nearly perpendicular, with a gentle convexity near the middle; densely yellow dusted; two spots on the tubercle and a stripe on the cheeks black. Frontal triangle small, not swollen, with a shining black spot; vertical triangle yellowish dusted in front; eyes briefly contiguous. Mesonotum deep black, with a whitish pruinosity; not shining, bare, except three bands of bright yellow tomentum; the first band lies on the anterior part, behind the humeri, and descends more slenderly obliquely backward on the mesopleuræ, nearly to the middle coxæ; the middle band, the narrowest, extends across just behind the suture; the third, the broadest, forms an arc of a circle on the posterior part, reaching nearly to the ends of the middle band. Pleuræ nearly black, lightly dusted; behind the previously mentioned yellow stripe there is another elongate spot, as though a continuation of the middle dorsal band, interrupted by the root of the wings. Scutellum triangular, black, lightly pubescent. Abdomen black; the second and third segment on each side with a large trapezoidal yellow spot, leaving an inverted T-shaped space on the second, a more triangular space on the third, opaque black; first segment, the narrow edges of the two following, the narrow hind margin of the third, and the remainder of the abdomen, wholly shining, somewhat metallic, black; in shape, the abdomen is very narrowly oval. Four front femora and tibiæ reddish yellow; hind femora, except the base, and the hind tibiæ more brownish yellow or brown; first two or three joints of all the tarsi yellow, distal joints brown. Wings grayish hyaline; the elongate stigma, extending as a narrow cloud along

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the costa to near tip of the second vein, where there is a narrow transverse spot, reaching into the first posterior cell; third vein straight, outer anterior angle of first posterior cell acute, the cell short petiolate; false vein wholly wanting.

♀. Front narrowed above, plane, black, not shining; below the middle a narrow, complete, yellow, pilose band. Third abdominal segment wholly without yellow; spots on the second more broadly separated, less nearly square than in the male.

One male and three females, Chapada (December). This species, with the following ones, is a most interesting addition to our knowledge of the fauna. It is a true Lepidostola (*Lepromyia* Loew.; *Lepidomyia* Will.), though the dense scale-like tomentum is confined to the thoracic bands. The femora are all thickened, with a double row of short, strong spines below. The three species are all allied with the long-antennæd *Chrysogastræ*. The veins of the wings are strong, the neuration approaching nearly to that of *C. nigripes* Loew., except that the last section of the fourth vein is strongly bent near the middle, forming an acute angle at its insertion. The eyes, as restored over wet sand, show four or five brown (or purple?) horizontal, zigzag stripes.

13. **Lepidostola similis** n. sp.

♀.—Length 5 mm. Mesonotum with three bright yellow tomentose bands; fourth abdominal segment with two large, elongate, opaque spots.

A single specimen with the others, though closely resembling them, is evidently of a different species. The front is broader above, the face has a broad, shining black stripe, and both are rather thickly clothed with yellow tomentum like that of the thorax. The elongate yellow tomentose spot back of the stripe on the pleuræ is wanting, and in its stead there is a diffuse patch of fine white tomentum. The abdomen differs in having smaller yellow spots on the second segment. Large opaque spots on the third, and two large elongate ones, not reaching the hind margin, on the fourth. The last section of the fourth vein is strongly angulated, with a long stump of a vein projecting into the first posterior cell; the posterior cross-vein has also a stump. The stigma is blackish, the posterior cross-vein and anterior cross-vein with small, but distinct brown clouds. Lastly, the eyes differ in not having zigzag, but straight, horizontal markings.

14. **Lepidostola abdominalis** n. sp.

♀.—Length 6 mm. Black; third and fourth segments of abdomen densely yellow tomentose. Face shining black, in profile nearly vertical, descending much below the eyes. Antennæ slender, longer than the face, the third joint

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longer than the two nearly equal preceding joints together; in color nearly black, the first joint red at base. Front black, not shining; ocelli situated on a prominent tubercle. Occiput densely light pollinose. Thorax black, not shining, the pleuræ sparsely clothed with fine white tomentum. Abdomen black, the third and fourth segments wholly and densely clothed with bright yellow pubescence or tomentum. Legs pitchy black, the four hind tarsi, except the two terminal joints, yellow. Wings cinereous hyaline, the stigma yellow; first posterior cell closed near the costa, the last section of the fourth vein nearly straight.

One specimen, Chapada. I suspect that the mesonotum has been deprived of its tomentum, to some extent, at least; there remains a small spot of yellow tomentum near each post-alar callus; in front of the scutellum there may have been a distinct band. The antennæ are about as long as the middle femora. The eyes do not show any markings after restoration over wet sand; they are probably unicolorous in life.

15. **Melanostoma longicornis** n. sp.

♂ ♀.—Length 8 mm. Antennæ elongate, face pollinose on the sides with punctate spots; third segment of the abdomen with two yellow spots.

♂. Mesonotum bronze green.

♀. Front with two oval, opaque spots; mesonotum blue, with three black stripes; front tarsi dilated.

♀.—Face in profile nearly straight below the antennæ to within a short distance of the oral margin; shining black, sometimes bluish; in the middle and a stripe on the cheeks bare; on the sides rather thickly pollinose, leaving numerous small, round, bare spots. Antennæ brownish yellow, the third joint more brown; slender, nearly as long as the front; first and third joints of nearly equal length, the second short. Front below and at the vertex shining, bluish black; below the rather prominent ocellar tubercle an oval opaque spot on each side on a grayish pollinose ground. Thorax metallic blue, but little shining; mesonotum thinly pollinose, with three black stripes, the median one slender and dilated triangularly in front of the scutellum; the lateral ones beginning broadly at the suture and attenuated posteriorly. Pleuræ light pollinose. Scutellum shining metallic blue. Abdomen black, moderately shining, the first segment and the anterior angles of the three following segments shining blue; third segment with two reddish yellow spots in front. Wings hyaline, subcostal cell yellowish brown; the extreme tip of the wings brownish or blackish. Legs yellow, or reddish yellow; hind femora, except the base and hind tibiæ, deep brown; four front femora more or less brownish at the base; distal joints of four hind tarsi, and all of the front pair, brownish; front tarsi moderately dilated.

♂.—Mesonotum and scutellum shining metallic bronze green, with only feeble indications of stripes; pile longer, more abundant and yellow. Abdomen less shining, the first and fourth segments shining green. Wings tinged with yellow.

Five females and one male, Chapada. This species has the general habitus of a *Melanostoma*, notwithstanding the differences in the structure of antennæ and abdomen. In both sexes the abdomen is

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narrowed basally; in the female only on the second segment, which is gently concave on its sides; in the male it does not attain its full width till the tip of the third segment.

16. **Melanostoma scitulum** n. sp.

♂.—Length 7 mm. Allied to *M. longicornis*. Antennæ less elongate, the three joints of nearly equal length, the third not twice as long as wide. Face on the sides with a slender stripe and spot of pollen, not punctulate. Abdomen narrow, of nearly equal width throughout; fourth segment also with two yellow strigulæ. Four front tarsi wholly yellow. Wings hyaline, an elongate stigmatic spot and narrow clouds on the cross-veins, brown.

Two specimes, Chapada.

17. **Melanostoma bucephalus** Wiedemann (*Syrphus*).

Numerous specimens, Chapada. Wiedemann's description applies well to the males. The females are usually larger, reaching 13 mm. in length, and the mesonotum is not bronze colored, but deep shining blue; there is also a pair of yellow spots on the second segment. The shape of the abdomen is more oval than usual among Melanostomata.

18. **Syrphus gastrostactus** Wied.

A dozen male specimens from Chapada may be this, but the wings are only narrowly blackish in front, and only the hind tarsi may be called white with their tip brown; the other tarsi are more yellow or brownish. The spots on the abdomen are small and oval. On each outer end of the transverse suture, and on the post-alar callosities, there is a small yellow spot.

19. **Syrphus erraticus** n. sp.

♂ ♀.—Length 10—11 mm. Face, frontal triangle and cheeks, deep shining blue; on the sides of the face yellow, with whitish pollen; frontal triangle with black pile and a small opaque spot; front narrowed above, across the middle with a narrow pollinose band, above which the color is more opaque. brown, or coppery black. Antennæ brown; third joint pointed, more than twice as long as wide. Eyes bare. Thorax bluish black, or blackish blue; mesonotum with three opaque black stripes, the median one linear, the outer ones acute behind. Scutellum opalescent yellow; a slender crescentic brown band before the narrow yellow base. Abdomen oval, black, moderately shining; second segment with two yellow bands, not attaining the lateral margin; the first band is a little broader exteriorly and interrupted in the middle; the second is crescentic, emarginate in the middle behind, and acute on the outer ends. Halteres with a yellow head. Wings hyaline, with the anterior part dark brown; the brown fills out the first basal cell, and the submarginal, except an elongate space in the middle behind. Legs pitchy brown; the hind legs more black; the middle tibiæ at the base yellow.

Ten specimens, Chapada.

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20. **Mesograpta anchorata** Macq.

Chapada, several specimens.

21. **Mesograpta musicus** Wied.

One specimen, Corumbá.

22. **Mesograpta** sp.

Not unlike *M. insignis* Schiner, but the anterior black dilatation of the third and fourth abdominal segments projects each side more acutely, and does not have the small, oval, lateral spot; the face is more or less blackish in the middle, the antennæ brownish or blackish above, the scutellum black with a yellow margin, and the hind tibiæ and tarsi brownish or blackish.

Numerous specimens, Chapada.

23. **Mesograpta** sp.

There are three or four other species from Rio de Janeiro and Chapada that I am unable to determine.

24. **Ocyptamus dimidiatus** Fabr.

Numerous specimens, Chapada, Rio de Janeiro.

25. **Ocyptamus trigonus** Wied.

Baccha torva Williston, Synopsis N. A. Syrphidæ, 124.—Texas.

Forty specimens, Chapada. The description of *B. torva* applies better than does Wiedemann's, nevertheless, there is no doubt of the determination.

26. **Ocyptamus funebris** Macq.

Ten specimens, Chapada, Rio de Janeiro.

BACCHA.

TABLE OF SPECIES.

1. Alulæ rudimentary; mesonotum shining black with slender pollinose stripes, yellow on the sides.....2.
   Alulæ not rudimentary .....5.
2. Very slender species; abdomen as long, or longer than the wings.....3.
   Less slender: abdomen shorter than the wings; face yellow .....4.
3. Front below finely rugose..... **stenogaster** n. sp.
   Front not rugose below..... **variegata.**
4. Wings hyaline, with the subcostal cell and a spot in the end of submarginal brown..... **exigua** n. sp.
   Wings uniformly tinged with yellowish brown. .....sp.

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5. Red or yellowish species; front with a more or less pronounced obtuse antenniferous projection marked with a round black spot; front of female narrow above, the ocelli rather remote from the vertex; mesonotum (except the sides) in ground color black, concealed beneath dense ochraceous pollen, leaving more or less apparent black stripes; legs yellow, the hind femora or tibiæ more or less brownish or blackish.....6.
Not such species; black or blackish.....9.
6. Three antennal joints of nearly equal length; front tarsi of female noticeably widened.....**conjuncta.**
First two antennal joints short.....7.
7. Third and fourth abdominal segments with slender yellow stripes.....8.
Third and fourth abdominal segments with slender spots in the shape of a rectangular V.....**placiva** n. sp.
8. Black stripes of mesonotum conspicuous; wings broad, brownish yellow. **phæoptera.**
Black stripes inconspicuous, mostly concealed beneath light pollen; smaller species.....{**livida.** **flavipennis.**
9. Wings hyaline, except the immediate base; hind femora and tibiæ black ciliate; penultimate joints of hind tarsi white; front tarsi of female dilated.....**pilipes.**
Not such species.....10.
10. Face projecting, yellow with a black stripe; wings hyaline with the subcostal (and costal ♂) cells clouded.....**clavata.**
Face not projecting, wings more or less extensively brown.....11.
11. Hind tarsi, except base of metatarsi, white.....12.
Hind tarsi not white.....13.
12. Abdomen broadly spatulate distally.....**clarapex.**
Abdomen not broadly spatulate distally; the whole apex of the wings in both sexes hyaline; smaller species.....sp. 40.
13. Thorax deep blue.....sp.
Thorax black: third and fourth abdominal segments each with four oval yellow dots, in two pairs, the anterior pair remote, the posterior pair approximate.....**adspersa.**

27. **Baccha stenogaster** n. sp.

♂.—Length 7—8 mm. Frontal triangle metallic, blackish blue, finely rugose. Face of the same color, thinly dusted, on the sides and below yellowish. Antennæ yellowish red, third joint short, yellowish red. Mesonotum metallic bronze black, in front with two pollinose stripes. Pleuræ largely obscurely yellowish. Abdomen very slender; shining black; first segment on the sides, the second and third with a basal band and one just beyond the middle, fourth segment at the base, yellow. Wings short and small; hyaline, the costal cell, beyond the tip of auxiliary, brownish yellow; third vein nearly straight, terminating at the tip of the wing; last section of fourth vein *f* shaped, terminating rectangularly. Legs yellow, the hind metatarsi a little thickened.

Two specimens, Chapada. The species is allied to *brevipennis* and *rugosifrons* Schiner, but differs in the color of the legs and markings

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of the abdomen. In one of the specimens, the hind tibiæ and tarsi are a little darker colored, and the fourth abdominal segment does not show a yellow band at its base.

28. **Baccha variegata** Macq.

A male specimen from Rio de Janeiro. Macquart's description leaves no doubt of the determination. The third vein is less convex and the fourth less oblique than he figures them.

29. **Baccha exigua** n. sp.

♂ ♀.—Length 5½ mm. Face and front yellow (or reddish yellow), narrow; a small round black spot near the base of the antennæ above; from just in front of the ocelli, which are rather remote from the vertex, the front is shining black. Antennæ reddish yellow, small. Mesonotum, except a yellow lateral stripe, shining black, with three densely pollinose, approximate, light yellow stripes, the median one reaching nearly to the scutellum, the lateral ones abbreviated behind. Scutellum yellow, a large semi-oval spot on the dorsum, and a small one on each lateral margin at the base, deep shining black. Pleuræ yellow, with two or three metallic blue spots; pectus metallic blue. Abdomen elongate spatulate in the female, narrower and more cylindrical in the male; shorter than the wings; shining black, in the female with three longitudinal yellow stripes on each of the segments and an oblique lateral spot (effected by drying?). Legs yellow; hind femora before the end with a blackish, hind tibiæ with two narrow brown rings. Wings hyaline; subcostal cell brown; a triangular brown spot filling out the end of the submarginal cell from beyond the end of the fourth vein; third vein nearly straight, terminating at the tip of the wing; last section of the fourth vein nearly straight and rectangular; alulæ rudimentary.

Two specimens, Chapada.

30. **Baccha conjuncta** Wiedemann (*Syrphus*).

Wiedemann's description applies excellently to a single female specimen, except in the color of the terminal segments of the abdomen; the third and fourth segments are black with a yellow anterior band, the fourth and fifth with two yellow longitudinal spots. The elongate antennæ and the unusual shape of the abdomen, which acquires its greatest width in the third segment, make the insect rather peculiar for a *Baccha;* nevertheless, its relationship with *B. phæoptera* is very evident. The anterior tarsi are dilated in the female, and the ocelli are placed considerably forward.

31. **Baccha phæoptera** Schiner.

Numerous specimens, Chapada. In the second line of Schiner's description *divergirend* should be read for "convergirend." In all the specimens, there is a median linear yellow stripe. One of the specimens with the rest I am in doubt whether to locate with this or

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the next. The color of the wings is as in *phœoptera*, but the thorax is like that of *livida*, and the wings in breadth seem intermediate between the two.

32. **Baccha livida** Schiner.

Numerous specimens, Chapada. Both males and females among themselves differ very materially in size, but I cannot distinguish them specifically. The abdomen among the females differs very materially in the shape of the second segment, and all those in which it is broad seem to have the front somewhat broader above. *Baccha lineata* Macq. seems to be an allied species.

33. **Baccha** n. sp.

Several closely allied specimens differ from *phœoptera* and *livida* in the wings being nearly hyaline, with the costal and subcostal cells yellow; in the pile of the thorax and abdomen being longer and more abundant; in the hind femora and tibiæ being darker, and briefly black ciliate, and in the structure of the abdomen. The abdomen is not as long, and not as slender basally; in the male the second segment (first of Schiner) is scarcely more than twice as long as wide; in the female scarcely twice as long as its distal width; in both sexes there is an oblique yellow spot on each side distally. In both sexes the remaining segments are less dilated and the black stripes of the mesonotum are narrower.

34. **Baccha flavipennis** Wiedemann (*Syrphus*).

Numerous specimens from Chapada. The identification is not very doubtful if an error is assumed in Wiedemann's description of the abdomen. He speaks of six segments in the male abdomen, whereas there are but five, and the second segment should read "rein braun, an jeder Seite der Spitze mit rötlich gelbem Querflecke, dritte bis fünfte mit zwei," etc., "der dritte Abschnitt allmählig erweitert." The species is allied to the preceding ones, especially the last, the head and legs being as in the last specimen, the markings of the abdomen like those of *livida;* the hind tibiæ are noticeably black ciliate. The female wings differ markedly in being brown on the basal portion, hyaline distally. The abdomen is much less constricted basally than in any of the preceding, the second segment being nearly as broad distally as it is long. *Syrphus rubricosus* Wied. seems to be a nearly allied species, but there are also some discrepancies here in the markings of the abdomen. Our specimens vary in length from six to nine millimeters.

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35. **Baccha placiva** n. sp.

♂ ♀.—Length 11 mm. Structure and coloration of head, thorax and legs as in *B. phæoptera*. Abdomen, male: first segment yellow with a blackish brown cross-band; second segment elongate, cylindrical, but little widened distally; in color reddish yellow with the distal end blackish; third segment nearly as broad as the thorax distally, brownish black with two oblique reddish stripes, in the form of a V, separated by a linear space in front and running into the posterior margin behind; fourth segment a little broader than long, with the same color and markings as the third, and (apparently) a yellow longitudinal stripe on each side. In the female the second segment is nearly as slender as in the male, the three following segments with a V-shaped marking as in the male and a lateral longitudinal stripe or margin. Wings yellowish brown in front, the costal cell yellow; behind broadly grayish hyaline; third longitudinal vein with a deep sinuosity into the first posterior cell, almost as in species of *Didea*.

Two specimens, Chapada.

36. **Baccha** sp.

A single injured female specimen, belonging in the group with the foregoing, has the costal and marginal cells yellow, and the subcostal brown, the rest of the wing hyaline; the abdomen is not broad, and not cylindrical basally, the second segment but little longer than the third and not twice as long as its greatest width; the second segment with two yellow and two brown bands, the third, fourth and fifth each with the anterior border and anterior lateral yellow and two oval oblique yellow spots, connected or not with the yellow margin in front. Length 11 mm.

37. **Baccha pilipes** Schiner.

Three specimens, male and female, Chapada. The identification is not at all doubtful, though Schiner leaves it to be inferred that the abdomen is shining black, whereas it is deep opaque black; the parts he describes as reddish yellow in these specimens are more metallic blue. The last two joints of the hind tarsi are brown.

38. **Baccha adspersa** Wied.

Numerous specimens, Chapada.

39. **Baccha clarapex** Wied. (*Syrphus*).

Wiedemann's description leaves no doubt of the correctness of the determination of numerous specimens from Chapada and Uarcarizal, though to no one will it fully apply. In almost every case the frontal triangle and the median portion of the face is shining steel-blue, not black; in only one or two specimens the yellow spots of the abdomen are as he describes them; in most cases there is an additional

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pair in front, and generally they are only represented by shining spots on the opaque. Only the hind tarsi are white. The female has the whole distal end of the wing hyaline.

40. **Baccha** sp.

Allied to *clarapex*, but smaller, the abdomen less spatulate, apparently without the strigulæ, the wings wholly hyaline at the tip (for a greater distance in the female) and the axillary angle not hyaline. The tibiæ of the four anterior legs in the female are yellowish at the base. Six specimens, Chapada.

41. **Baccha clavata** Fabr.

Baccha Babista Walker, List, etc., iii. 549 (male); Williston, Synopsis N. A. Syrphidæ, 117, pl. iv, fig. 9.—N. Amer.

Baccha facialis Thomson, Eug. Resa, 504 (female).—Galapagos.

Spazigaster bacchoides Bigot, Ann. Soc. Ent. Fr. 1883, 326.

Numerous specimens. It is not impossible that *B. fusciventris* Wied., is the female of this species.

42. **Salpingogaster nigra** Schiner.

Numerous specimens from Chapada and Rio de Janeiro. The description leaves no doubt of the identity. I observe but little differences between the front tarsi in the two sexes; in the male there is a small, but distinct angulation of the hind tibiæ.

43. **Salpingogaster pygophora** Schiner.

Two specimens, female (Rio de Janeiro) and male (Chapada). I refer the two doubtfully to each other, and more doubtfully to this species, but, as Schiner was in doubt himself as regards the union of the two sexes he described, it is possible that they all may belong to one variable species. The pleuræ of the male are broadly yellow and brownish yellow, the mesonotum less dark, the vertical triangle shining black, and the hind femora without any dark ring. In the female the thorax is as described for the male, the scutellum for the female, the abdomen more of a deep brown than black, the legs yellow with the hind femora, except the tip, black, the distal part of hind tibiæ and the tarsi reddish yellow. In his specific descriptions the second segment of the abdomen is called the first, etc. By comparing the portion bearing the mammiform processes at the base with the corresponding part in *Ceria*, *Baccha*, *Melanostoma*, etc., it will readily be seen to be the first segment. There is a very marked difference in the male hypopygium between this and the preceding species, but similarity of structure, otherwise, is too great to distinguish them generically.

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VOLUCELLA.

TABLE OF SPECIES.

1. Scutellum with six stout spiniferous tubercles.....**scutellata.**
   Scutellum without tubercles; with or without bristles.....2.
2. Deep metallic species, the abdomen without light markings.....3.
   More or less reddish, yellowish, or brownish, the abdomen not uniformly dark metallic.....6.
3. Face and front metallic like the thorax.....4.
   Face and front reddish yellow; wings with a large quadrate brown spot. **meretricias** n. sp.
4. Second longitudinal vein sinuous before its tip, marginal cell petiolate; third joint of antennæ short.....5.
   Second vein regular, ending in the costa or tip of first vein...**viridis** n. sp.
5. Bright metallic, usually green, species; wings nearly hyaline at base. **obesa.**
   Deep blue; wings deep brown at base.....**æmula** n. sp.
6. A transverse row of bristles on the mesonotum in front of the scutellum...7.
   No such bristles present.....9.
7. General color metallic reddish; a well-defined quadrate spot on the wings. **macula.**
   Mesonotum deep blue, with violet reflections; wings clouded distally; more elongate species.....8.
8. Front black; marginal cell petiolate.....**prescutellaris** n. sp.
   Front reddish yellow; marginal cell closed in the costa, or open. **persimilis** n. sp.
9. Second longitudinal vein strongly sinuous near the tip; wings variegated. **picta.**
   Second vein regular, not bent into submarginal cell.....10.
10. Face acuminate, projecting strongly forward; front shining black; dark species; wings without dark spot.....**fuscipennis.**
    Face not remarkably acuminate, not projecting strongly forward; largely reddish or yellowish species.....11.
11. Disk of mesonotum black or metallic brown; marginal cell open or briefly petiolate.....12.
    Mesonotum reddish or yellowish.....13.
12. Legs black, femora, except distal fourth, light yellow; mesonotum shining black, with the lateral margins yellow.....**musta** n. sp.
    Legs reddish brown; mesonotum metallic brown, the sides and posterior expansion yellow.....**mus** n. sp.
13. Wings pure hyaline, stigma minute.....**pallens.**
    Wings clouded distally; stigma small.....**? punctifera.**

44. **Volucella scutellata** Macq.

Two female specimens I doubtfully refer to this species. They have the six singular spiniferous tubercles on the scutellum. The face is in no wise black below, the red pile of the front is only blackish in certain reflection, the pile of the mesonotum is wholly light fulvous and not at all black, and the wings are hyaline with a quad-

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rate dark brown spot. The third joint of the antennæ is gently concave. In front of the scutellum there are six short approximated black spines in a row. Macquart says: "extremite de la face noire. Thorax et abdomen à poils noirs," and, of the wing nervures: "transversales bordées de brun, ainsi que le stigmate."

45. **Volucella meretricias** n. sp.

♂.—Length 10—12 mm. Eyes fulvous pilose. Frontal triangle small, a little protuberant, with a little black pile in the middle; of the same color as the face. Face translucent reddish yellow, projecting downwards and forwards, the under margin of the cheeks concave, the facial concavity long, the tubercle large and obtuse. Antennæ a little more reddish than the face, slender, the third joint gently excised above and narrowed on the distal part; the arista with moderate pilosity. Thorax deep blue with violet reflections, with erect black pile and some white pubescence. Scutellum like the mesonotum. Bristles on the sides of the mesonotum and margin of the scutellum, and a transverse row in front of the scutellum. Abdomen deep blue, with violet reflections, with short, black pile. Legs black. Wings grayish or brownish subhyaline; a large quadrate brown spot reaching from the costa to the fourth vein and thence to the proximal part of the posterior basal cross-vein; costal, subcostal and first basal cells clouded; marginal cell regular, closed.

♀.—Front a little darker than the face, clothed with black pile; a short, crescentic groove on each side. Abdomen nearly bare, except distally. Third antennal joint broader.

Six specimens, Chapada and Rio de Janeiro. The species is allied to *Temnocera Frauenfeldi* Schiner, but will be distinguished by the blue color and wing spot.

46. **Volucella obesa** Fabr.

Thirty-eight specimens from Chapada and Rio deJaneiro.

47. **Volucella æmula** n. sp.

♀.—Length 15—18 mm. Closely allied to *V. obesa*, but differs in the deeper blue color, showing only moderate green reflections on the mesonotum, and at the tip of the abdomen. In the larger size (*V. obesa* rarely exceeds 12 mm.) and in the wings being deep brown at the base. The wings are more infuscated in front, the quadrate spot from the stigma to the cross-vein is larger, as is also the spot at the tip of the marginal cell. In the structure of the antennæ, wings and face they scarcely differ.

Two specimens, Piedra.

48. **Volucella macula** Wied.

Four specimens from Chapada I identify as this. There is a difference in the amount of red color on the thorax and abdomen, and in the depth of violet reflections. The arista is long and finely plumose, there is no emargination on the upper part of the third an-

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tennal joint, and there are bristles on the lateral margin of the mesonotum, on the border of the scutellum, and an even row of about ten in front of the scutellum. The veins of the wings in two are distinctly clouded, in the other two scarcely at all. The front of the female is narrow and red. The middle legs have bristles and spurs as in *V. prescutellaris*.

49. **Volucella prescutellaris** n. sp.

♂.—Length 11—12 mm. Frontal triangle black, but largely obscured by the reddish yellowish pollen; in the middle with an acute tubercle, the profile showing two straight lines meeting at an angle of about one hundred degrees. Antennæ reddish yellow, the distal part of the third joint narrowed, though but little excised; arista long and thickly plumose. Face translucent yellow, only shallowly concave below the antennæ, the tubercle large and obtuse; lower margin of the cheeks nearly straight, meeting the plane of the occiput at an angle of about one hundred and ten degrees. Mesonotum blue, with strong violet reflections: pile moderately abundant, golden yellow. Scutellum translucent yellow, with black pile on the disk. Pleuræ blackish brown, somewhat dusted above; pile yellow. The sides of the mesonotum, mesopleuræ, post alar callosities, a transverse row in front of the scutellum, and the margin of the scutellum with strong black bristles. Abdomen *Musca*-like in shape, with erect black and yellow pile; first segment black, except the lateral angles; second segment yellow, with a median stripe extending along the anterior suture outward, black or brownish black; third segment yellow, with a posterior band, dilated in the middle into a stripe that reaches the front margin, black; fourth segment black with blue reflections, and with the anterior angles reddish or yellowish. Legs black, with black pile; tibiæ and metatarsi more or less reddish; middle femora on the posterior side near the tip with two or three bristles, and the middle tibiæ with three or four well-defined spurs at the tip. Wings nearly hyaline, the outer part brown or brownish, behind tinged with blackish; marginal cell closed some little distance before the costa.

♀.—Front shining black, with black pile; the narrow orbit below the ocelli, and the sides below, thickly grayish yellowish pollinose; corresponding to the tubercle in the male, there is an obtuse convexity. Third antennal joint broader.

Eleven specimens, Chapada. The color of the abdomen varies posteriorly, so that it sometimes appears black, with the sides of the third segment in front reddish or yellowish.

50. **Volucella persimilis** n. sp.

Remarkably like the preceding, though certainly distinct. The frontal triangle of the male is yellow, not black, and is only gently convex, not angular in profile; the third joint of the antennæ is less narrowed distally, and the cheeks have a black or brown stripe. In the female, the front is translucent reddish yellow, without the convexity and depression of *V. prescutellaris*. In both sexes the lateral

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margin of the mesonotum and the pleuræ are yellowish red, the legs are brownish red throughout, and the marginal cell is either closed in the margin or narrowly open.

Eleven specimens, Destares, Chapada and Rio de Janeiro. The wings in both species vary in the depth of brown color on the outer part.

51. **Volucella musta** n. sp.

♂.—Length 9—10 mm. Frontal triangle and face light yellow, with similarly colored pile; cheeks shining black, except behind. Antennæ reddish yellow, third joint rather short, not at all incised; arista not densely, moderately long, plumose. Facial concavity strong, tubercle hemispherical; lower part moderately acute, produced only a little forwards. Thorax light yellow, with moderately abundant, light yellow pile; mesonotum, except the broad lateral margins, and a spot on the meso- and sterno-pleuræ, shining black. Scutellum light yellow, the distal margin narrowly brown. Sides of the thorax and margin of scutellum with weak yellow bristles. Abdomen: first and second segments light yellow, the second with a linear median reddish stripe, and a posterior narrow blackish brown band; the following segments each with a similar posterior band, with the other parts yellowish, reddish, brownish, or blackish; pile very short, chiefly blackish. Legs black, with short, yellow and black pile. All the femora, except their distal fourth or fifth, light yellow. Wings lightly tinged with yellowish; the small stigmatic spot brown, the cell beyond it yellow; marginal cell closed in the border or narrowly open.

Nine specimens, Chapada, November, January. The black of the cheeks has an indication of a yellow bisection, and the black of the mesonotum has, in one specimen, a distinct violet reflection.

52. **Volucella mus** n. sp.

♂.—Length 9—10 mm. Frontal triangle small, light yellow. Antennæ reddish yellow, of moderate width, not excised, longer than in *V. musta;* arista rather strongly plumose. Face yellow; a median stripe, and one on the cheeks, brown; tubercle obtuse, below slenderly conical, produced forwards, the lower border of the cheeks concave. Mesonotum coppery red, with strong violet reflections; the lateral margins, and angular expansion behind, yellow. Pleuræ yellow and brownish red. Scutellum yellow; red, with violet reflections across the disk; impressed before the tip. A black bristle on the upper part of the mesopleuræ, a row on the lateral margin of the scutellum. Abdomen yellow; second segment with a blackish brown posterior band; third with a similar band, sending three slender prolongations to the front margin; fourth with a median stripe and an oblique lateral spot. Legs luteous, the tibiæ and tarsi brownish. Wings hyaline, with a yellowish tinge distally; the subcostal cell beyond the small brownish stigma yellow; marginal cell closed and petiolate.

♀.—Front luteous yellow, with a brownish interrupted median stripe; third joint of the antennæ a little broader.

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Eleven specimens, Chapada. The marginal cell varies much, as does also the color of the distal abdominal segments. The disk of the mesonotum is sometimes coppery red, with only a weak purple or violet reflection, at other times deeper.

53. **Volucella punctifera?** Bigot (? *V. testacea* Rondani).

Two specimens (♀ ♀) agree with Bigot's description fairly well, but its brevity will not permit any certainty in the determination. The marginal cell is closed in the costa, and the tibiæ and tarsi are blackish, rather than brownish.

54. **Volucella pallens** Wiedemann (*V. sexpunctata* Loew.).

Two specimens, Rio de Janeiro. The specimens offer no noteworthy differences from North American ones.

55. **Volucella tympanitis** Fabr.

One male specimen, Chapada.

56. **Volucella picta** Wied.

Fourteen specimens from Chapada. The species is closely allied to *pusilla* Macq., but is distinct. There is so much variation among the specimens that identification might be doubtful with certain isolated ones. While in some of the females the median facial stripe is but little darkened, in the greater number there is a distinct black stripe. In all the males there is a quadrate lateral spot in front of the suture; in the females there is an additional, slender, acuminate spot from the suture to the post-alar callus. The thorax in the males is chiefly black pilose above; in both the males and female there is black pile on the borders of the scutellum; the small, yellow, prescutellar spots are sometimes wanting, etc.

57. **Volucella viridis** n. sp.

♂.—Length 7—8 mm. Eyes with erect white hairs, giving a peppered appearance on front view. Frontal triangle small, yellow, third joint not at all incised; arista chiefly yellow, thinly but moderately long, black plumose. Face shining green, with blue reflections, sparsely clothed with yellowish hair; projecting downward, but not acutely so, the concavity above deep, the tubercle rather obtuse. Thorax brilliant shining green, the mesonotum with violet reflections; pile erect, not very abundant, golden yellow. Scutellum violet, the tip more or less luteous; before the tip with a transverse depression. Lateral margins of the mesonotum and scutellum with hairy bristles. Abdomen wholly bright shining green, with erect, short, yellow pile. Legs luteous, the hind femora with some green reflections; all the femora and tibiæ with pile, chiefly black, giving a ciliated appearance, especially on the hind tibiæ; hind metatarsi a little thickened. Wings nearly hyaline on the basal half or more, abruptly brownish on the outer part; marginal cell narrowly open.

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♀.—Front of equal width, shining green with yellowish pile; below the somewhat swollen vertical portion, the front is excavated, leaving a large, obtuse, median tubercle.

Five specimens, Chapada. There is a more or less ill defined yellow spot or stripe on the anterior part of the cheeks.

58. **Volucella fuscipennis** Macq., Dipt. Exot. ii, 2, 24.

Two male specimens, Chapada. The species, as Macquart observes, is nearly related to *V. vesiculosa*. The wings have a minute stigmatic spot, and in both specimens the marginal cell is narrowly open.

APOPHYSOPHORA gen. nov.

Allied to *Volucella*. First two joints of the antennæ short, third elongate; arista plumose. Face descending downward as in *Volucella*, with a well-marked tubercle; sparsely pilose. Front in female narrowed above, on each side with a crescent-shaped groove; tuberculate, one tubercle at the vertex, bearing the ocelli, the other about midway between it and the base of the antennæ; eyes of male contiguous. Sides of thorax and margin of scutellum with bristles. Scutellum strongly gibbose and tuberculate above. Abdomen short, broad, flattened. All the femora and tibiæ are ciliate. Eyes pilose, leaving numerous separated or subcontiguous round lighter colored spots bare. Marginal cell closed or open.

59. **Apophysophora hirtipes** Macquart (*Volucella*).

♂ ♀.—Length 8—9 mm.; width of abdomen 5 mm. Black, abdomen partly luteous; feet pitchy reddish black; wings grayish hyaline with a large brownish yellow spot; hind tibiæ crescentic. Face shining black, the prominent rounded tubercle somewhat pitchy; pile moderately abundant, white; cheeks behind with a yellowish spot or stripe. Third joint of antennæ reddish brown, cinereous, not excised on either border; arista with dense short pile on its whole length and less abundant, longer plumosity of the ordinary *Volucella*. Median frontal tubercle of the female less projecting than the vertical one; vertex with black pile. Mesonotum shining black, with bronze or metallic reflections; not thickly pilose, in front and behind light colored, cross the middle, black. Scutellum pitchy red, black and yellow pilose; strongly gibbose above, forming two stout, obtuse, tubercles, separated by a shallow, broad notch, the superior posterior part shallowly concave; viewed from in front the tubercles appear to be on the margin of the scutellum, but from the side there is seen a flattened declivity to the rounded margin upon which the bristles are implanted. Abdomen shining, black, or pitchy black, the base luteous on the sides. Legs reddish, or pitchy brown or black, the pile black; all the tarsi, except the hind metatarsi, reddish yellow; hind tibiæ very much dilated, crescentic; hind metatarsi swollen. Wings nearly hyaline at base, lightly infuscated without and behind; near the middle in front with a large diffuse brownish spot; veins mostly yellow; marginal cell closed or narrowly open.

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Two specimens, Chapada. This species does not agree wholly with Macquart's description, but I think it is the same. All the tibiæ are "herissées de poils," and the figure of the legs is not at all correct. Bigot placed this species in the genus *Phalacromyia*, for what reason I do not know, as he seems to have been unacquainted with it. *Phal. vicina* Bigot he believes to be nearly allied, from the pilosity of the hind tibiæ, though it has the scutellum normal. *Phal. melanorrhina* Bigot seems to have a similar frontal tubercle. Especially characteristic of the genus is the peculiar style of ocular pilosity.

60. **Apophysophora scutellata** n. sp.

♀.—Length 5—6 mm. Antennæ reddish brown, or reddish black; the arista yellow, long and loosely plumose. Face pitchy black, sparsely light yellow pilose, with whitish pollen below the antennæ; tubercle obscurely yellowish; the cheeks in front with a yellow or luteous stripe to the oral margin. Front shining black, vertical tubercle very prominent, sharply conical; median tubercle small, but very distinct, rounded. Mesonotum metallic bronze black, with light yellow pile, and, across the middle, black pile. Scutellum wholly translucent, light amber yellow; large, swollen, as long as wide, obtusely triangular in side view, at the base projecting directly upwards to a level with the top of the dorsum, forming three rounded tubercles, shallowly separated, the middle one the most prominent. Abdomen pitchy black, shining, the first segment and the base of the second yellow. Legs black pitchy, the tarsi yellow; all the femora and tibiæ short ciliate with black pile; hind tibiæ moderately arcuated and dilated. Wings nearly hyaline on the basal posterior part, in front yellow or yellowish; from beyond the anterior cross-vein infuscated, brown in front; marginal cell wide open.

♂.—Ocellar tubercle and frontal triangle moderately swollen, shining green. Abdomen more reddish, the second segment with two opaque black spots.

Twelve female and two male specimens, Chapada.

ERISTALIS.

TABLE OF SPECIES.

Arista bare; eyes pilose; hind femora thickened.

1. Dorsum of thorax with one or more ashy or shining transverse bands.....2.
   Dorsum uniform in color, or with longitudinal stripes.....13.
2. A complete transverse band in front of the scutellum.....6.
   Dorsum opaque black in front of the scutellum.....3.
3. Presutural ashy band distinctly interrupted.....sp.
   Presutural band entire.....4.
4. Marginal cell distinctly widened before its tip (i. e. the second vein has a slight, but distinct curvature backward before its end); no gray clouds in the marginal and submarginal cells.....**albifrons.**
   Marginal cell regular, second vein not curved before its end.....5.

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5. Antennæ light reddish yellow; pile of the female front light yellow, except at the vertex; no gray clouds in the marginal and submarginal cells. **tænia.**
   Antennæ reddish brown; pile of the female front black; gray clouds in the marginal and submarginal cells..... **podagra.**
6. Prescutellar thoracic band shining; abdomen more elongate.....11.
   Prescutellar band opaque.....7.
7. Marginal cell widened before its end, a distinct curvature of the second vein into the submarginal cell; frontal triangle with whitish pile; marginal and submarginal cells without gray clouds.....8.
   Marginal cell regular.....9.
8. Third abdominal segment opaque..... **nigripes.**
   Third segment with a narrow shining cross-band..... **? rufiventris.**
9. Front and frontal triangle with black pile.....10.
   Frontal triangle and front (except on the upper part) light yellow pilose; shining band on the third segment entire; gray clouds in the marginal and submarginal cells..... **vinetorum.**
10. The post-sutural black thoracic band crescentic in shape; scutellum without black on the sides..... **? agrorum.**
    The post-sutural band not crescentic; sides of scutellum black; no gray clouds in the marginal and submarginal cells..... **schistaceus** n. sp.
11. Second abdominal segment without a posterior black band.. **volaticus** n. sp.
    Second segment with a posterior opaque black band.....12.
12. Legs black..... { **scutellaris.** **conicus.**
    Legs almost wholly reddish yellow..... **præcipuus** n. sp.
13. Dorsum of thorax with opaque black markings on an ashy ground.....14.
    Dorsum uniform or nearly so, in coloration.....15.
14. A single median black stripe..... **parvulus** n. sp.
    A geminate median black stripe, in the shape of a tuning fork... **furcatus.**
15. Thorax black; wings with a definite large brown spot..... **pygolampus.**
    Thorax dark reddish brown, with fulvous pile; wings infuscate. **obsoletus.**
    Thorax light ochraceous yellow; wings hyaline..... **ochraceus** n. sp.

61. **Eristalis pygolampus** Wied.

One male and two female specimens from Rio de Janeiro and Chapada. The third joint of the antennæ is reddish brown or brownish red, larger in the female; the yellow of the front is a very small semi-circular spot above the immediate base of the antennæ. The suture shows no trace of white pollen, and the scutellum is deep reddish brown. The third abdominal segments has a very narrow, the fourth a broader, yellow hind margin. The tarsi are light yellowish red throughout. The front of the female is rather narrow above, with black pile; the abdomen is nearly as in the male, the shining spots on the second segment being partly confluent.

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62. **Eristalis obsoletus** Wied.

Two specimens, Rio de Janeiro and Chapada. I would only add to Schiner's remarks that the pile of the femora is variable.

63. **Eristalis ochraceus** n. sp.

♂. Length 12 mm. Face yellow, thickly covered with light ochraceous yellow pollen; cheeks shining red. Front tinged a little darker than the face, with yellow pile. Antennæ and bare arista light reddish yellow. Eyes briefly pilose, the facets on upper half distinctly enlarged. Mesonotum densely opaque ochraceous yellow, with similar colored pile: four or six slender stripes, feebly indicated. Pleuræ lighter colored than the mesonotum. Scutellum opaque reddish yellow. First abdominal segment whitish yellow; second segment of the color of the scutellum, with a slender blackish brown anterior margin, a linear brown stripe, and a narrow posterior blackish brown band in front of the yellow hind margin; third segment blackish, with a red lateral spot and hind margin, and a narrow entire shining median band; fourth segment opaque blackish, with a shining metallic band; hypopygium shining. Legs red; base of the tibiæ and the tarsi, except their tips, yellow; distal portion of hind femora, and a ring on the hind tibiæ, blackish, the distal part of front femora and tibiæ brownish red. Wings pure hyaline; veins reddish.

One specimen, Chapada.

64. **Eristalis furcatus** Wied.

Two specimens, Rio de Janeiro and Chapada. The scutellum is as Wiedemann describes it. The synonymy of *furcatus* Macq. admits of no doubt.

65. **Eristalis scutellaris** Fabr.

Numerous specimens from Chapada and Rio de Janeiro. In one female specimen only, are there yellow spots on the second segment of the abdomen. *Doliosyrphus Rileyi* Will. is the same, as I suspected.

66. **Eristalis conicus** Fabr.

Twelve specimens, Rio de Janeiro and Chapada. Is closely allied to *scutellaris*, but will be distinguished in the female by the front being broad above, by the tibiæ, especially the hind pair, being lighter colored, by the median opaque stripe of the second abdominal segment not reaching the posterior band, by the smaller size, etc. The males differ, besides in the facial profile, in the antennæ being longer than in *scutellaris*. The margins of the scutellum are beset with short, dense, velvety black pile; the yellow spots of the abdomen are smaller, the hind femora larger, etc.

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67. **Eristalis precipuus** n. sp.

♂.—Length 12—13 mm. Allied to *E. scutellaris* and *conicus*, but easily distinguished by the red legs. Face thickly covered with white pile and pollen, leaving a shining median stripe and the cheeks narrowly shining black. Antennæ reddish brown, the basal joints and the arista more reddish. Frontal triangle shining black, with black pile. Eyes briefly pilose above. Mesonotum, in front, ochraceous gray, separated by a crescentic opaque black band from the presutural opaque gray band; behind the suture an opaque black band, in front of a broader, shining steel-blue band. Pleuræ largely silvery gray pollinose; some yellowish pile in front of the root of the wings. Scutellum opaque light yellow, with the base narrowly opaque black. Abdomen opaque black, second segment with two large quadrate yellow spots, leaving a rather broad median stripe and a posterior band; third segment with a large yellow spot on each side, narrowly connected on the front margin; fourth segment with an entire steel-blue shining cross-band; hypopygium shining steel-blue; second, third and fourth segments each with a narrow posterior yellow margin. Legs yellowish, sometimes brownish, red, the tarsi brown; hind femora considerably thickened. Wings grayish hyaline, often lightly tinged with brownish exteriorly.

♀.—Front shining black, at the vertex steel-blue, with black pile; an opaque band below the ocelli and the orbits below narrowly whitish pollinose. Spots of the second abdominal segment sometimes largely shining blue; third and fourth segments shining metallic blue with a posterior opaque band.

Fourteen specimens, Chapada. The antennæ are sometimes reddish or blackish, but never light colored.

68. **Eristalis vinetorum** Fabr.

Five specimens, Rio de Janeiro and Corumbá.

69. **Eristalis nigripes** Wied.

Six specimens, Rio de Janeiro, Corumbá and Uarcarizal. Is easily recognizable from Wiedemann's description.

70. **Eristalis agrorum** Wied.

Fifteen specimens (Chapada), as large and more elongate than *vinetorum*, I cannot identify with certainty. The antennæ are not "ocherbraunlichschwarz," but red, or brownish red. The fourth and fifth abdominal segments have no yellow spots whatever. Wiedemann's description, moreover, applies to the male only, though both sexes are given in his diagnosis. In the male, the spots of the second and third segments are very large, quadrate, with a very slender posterior brownish band on the second segment, and a narrow one on the third. Otherwise the description applies pretty well to our specimens.

71. **Eristalis volaticus** n. sp.

♂.—Length 10—11 mm. Face densely, nearly white pollinose; median stripe and cheeks shining black. Antennæ brownish yellow, the first two joints black-

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ish. Frontal triangle shining black, with black pile. Mesonotum with opaque black bands, the anterior margin and presutural band ashy, the posterior band moderately shining bluish; the post-alar callosities, the hind margin of the mesonotum, and the scutellum, except a small yellow spot at the tip, densely covered with short, deep black, velvety pile, wholly concealing the ground upon which it is inserted. Abdomen: first segment black; second segment light yellow with a median black stripe not quite reaching the hind margin; third segment yellow with a median stripe, as though a interrupted continuation of that on the second, connected with the narrow, sometimes partly obsolete band before the yellow hind margin, brown or blackish; fourth segment shining, somewhat metallic, black, with a median spot in front and a narrow band before the yellow hind margin, opaque black; in shape the segment is nearly square and flattened, cylindrical; hypopygium shining metallescent black. Venter, except the fourth segment almost wholly light yellow. Legs black; the base of the tibiæ and tarsi reddish, the hind femora chiefly dark red; hind tarsi with fulvous pubescence below; hind femora much thickened. Wings largely tinged with brownish, especially along the stouter veins.

Five specimens, Chapada, Corumbá and Rio de Janeiro.

72. **Eristalis podagra** Macquart, ♀.

E. surinamensis Macquart, ♂.

E. bifasciatus Macquart, ♂.

Eighteen specimens from Rio de Janeiro and Chapada. The eyes are pilose. Macquart describes them as bare in *E. podagra* and *surinamensis*, but as that mistake was not an infrequent one with him the discrepancy is of no importance. All three of these descriptions apply well otherwise; *E. surinamensis* is, however, placed under the group with the "cuisses posteriores greles," which may make the synonymy somewhat doubtful. The femora in both sexes are distinctly, though not greatly, thickened.

73. **Eristalis tænia** Wied. ? *E. annulipes* Macq.

Numerous specimens from Rio de Janeiro, Corumbá and Uaricazal. With Schiner's description of the thorax the determination seems pretty certain, but there is a considerable variation in the color of the legs, the four anterior ones often having considerable black. The hind femora are only a little thickened. I believe Macquart's species to be the same.

74. **Eristalis** sp.

Four male specimens from Rio de Janeiro and Chapada resemble *tænia* closely, but seem distinct in the black pile of the frontal triangle, and in the broadly interrupted presutural band.

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75. **Eristalis rufiventris** Macq.

A number of specimens from Chapada agree very well with Macquart's description, but positive determination is hazardous in the absence of Columbian specimens. Some of the males have a quadrate black spot on the third abdominal segment. The female has two spots of the second segment not attaining the hind margin, and the two following segments each with an opaque posterior band and metallic in front, the third with an anterior opaque spot; in some there is red on the third segment. The facial stripe is rarely black.

76. **Eristalis schistaceus** n. sp.

♀.—Length 9 mm. Face densely yellowish white pollinose, leaving the median stripe and the cheeks shining black. Front on the sides yellowish pollinose, immediately above the antennæ with a shining black spot, connected by a linear stripe with an opaque band above; immediately below the antennæ a narrow yellow pollinose band. Antennæ reddish brown. Mesonotum opaque ashy gray, slightly yellowish, with a narrow band a little before the suture, and another of equal width throughout behind, both interrupted by a line, opaque black; the second band is straight in the middle, making on each side an angle to curve forward and outward to the root of the wing. Scutellum light waxy yellow, its narrow base and the lateral margin opaque black. Pleuræ thickly whitish pollinose, with white and yellowish pile. Abdomen: second segment opaque black, with a large pruinose metallescent spot on each side, leaving a posterior and a median stripe, and contiguous with the front border outwardly only: third segment with an opaque black posterior band and a median anterior spot, a shining band across the middle, and on the front, laterally, pruinose like the spots of the second segment; fourth segment opaque black, with a shining cross-band; second, third and fourth segments each with a narrow yellow hind margin. Legs black; tibiæ at the base narrowly yellowish. Wings nearly pure hyaline. Hind femora thickened.

One specimen, Chapada.

77. **Eristalis parvulus** n. sp.

♀. Length 7 mm. Face black, thickly ashy pollinose, leaving a rather broad stripe and the cheeks shining black. Antennæ reddish brown. Vertex opaque black, a narrow ochraceous band in front of the ocelli and behind a broader opaque black band or spot, that is continued in a slender stripe to the shining black above the base of the antennæ; the sides of the front below the opaque spot yellowish pollinose. Mesonotum opaque yellowish ashy gray, leaving a median stripe gradually attenuated to a point anteriorly, a small spot in front of the inner end of the suture, and a large triangular spot behind the suture, extending to the scutellum posteriorly and outwardly along the suture to the margin, all opaque black. Scutellum at the sides metallic black, on its base above opaque black, leaving a rounded yellow spot above on the apical part. Pleuræ black, moderately shining. Abdomen opaque black; second segment with a triangle on each side, and the three following segments each with an entire band, metallic

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black. Legs black, their pile short, white; the knees and more or less of the base of the tibiæ reddish; hind femora much thickened. Wings hyaline, a small stigmatic spot.

One specimen, Chapada.

78. **Eristalis albifrons** Wiedemann; Roeder, Stett. Ent. Zeit. 1865, 340.—Brazil, Porto Rico.

Eristalis albiceps Macquart, Dipt. Exot. ii. 2, 56, 41; Williston, Synopsis N. A. Syrphidæ, 172.

Eristalis seniculus Loew, Centur. vi. 63.

One specimen, ♂, Rio de Janeiro.

79. **Pteroptila milesoides** Bigot.

Three specimens, Chapada. The description leaves no doubt of the identity.

80. **Pteroptila simplex** Schiner, Nov. Exped. 365.

Six specimens from Chapada agree essentially with the description. The third joint of the antennæ is sometimes red, and the hind femora below are more or less red. The species is closely allied in appearance and structure with the following, but will be at once distinguished by the slender median dorsal stripe being gray, not composed of yellow tomentum like the other markings of the dorsum; by the much less thickened, almost wholly black hind femora, etc.

81. **Pteroptila æmula** n. sp.

♂.—Length 15 mm. Eyes bare, narrowly contiguous; frontal and vertical triangles black, the former white pubescent on the orbital margin. Face thickly whitish pollinose, a broad median stripe and the cheeks, shining black. Antennæ brownish black, the arista luteous; third joint oval, not transverse. Posterior orbits densely light yellow pollinose. Thorax black, but very little shining; the mesonotum with a slender median stripe and the narrow posterior margin, a slender strigula on each side on the suture (not quite reaching the median stripe) and a slender oblique spot on each side behind the humeri, all opaque yellow tomentose. Pleuræ with a slender whitish pollinose vertical stripe. Abdomen opaque black; third and fourth segments opaque reddish yellow, due to short, dense, recumbent pile; third segment with a broad, bare, black, median band; third with the narrow front margin, and a slender transverse band of the same black; hypopygium densely yellowish pollinose. Legs black, the distal half of hind femora, and the hind tibiæ, except their tip, reddish yellow; all the tarsi brownish red; all the femora swollen, the hind pair extraordinarily so on the proximal two-thirds. Wings nearly hyaline behind, brown or brownish along the front margin; sixth vein strongly sinuous.

Two specimens, Chapada.

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HABROMYIA gen. nov.

Allied to *Mallota*, but the body elongate and bare. Front of the male narrow above, the eyes separated by the ocelli. Eyes bare. Front of female narrowed above. Antennæ situated on a prominent convexity, near the middle of the eyes in profile; short, the third joint oval, not transverse; arista bare. Face convex in profile below the antennal protuberance. Head much broader than the thorax. Abdomen elongate, scarcely as broad as the thorax, the sides of the first three segments nearly parallel, thence tapering in both sexes to a point. Legs rather slender, the hind femora elongate and a little thickened, and with short bristles below distally. Wings as in *Mallota*, the curvature of the third vein short and deep.

The genus is intermediate between *Mallota* and *Xylota*, and apparently will include *Mallota xylotæformis* Schiner. In shape, the abdomen cannot be very different from that of *Mallota eristaloides*, but the antennæ and bareness throughout seem sufficient to separate the genus.

82. **Habromyia cœruleithorax** n. sp.

♂ ♀.—Length 12—14 mm. Head black; face on the sides narrowly and thinly white dusted, the front in both sexes with a narrow pollinose orbital margin and across the middle; tip of the frontal process above reddish yellow. Antennæ brownish red, the arista brownish yellow. Dorsum of thorax deep shining metallic blue; finely punctulate, very nearly bare; in front in the middle with the beginning of two deep opaque stripes, separated by a line, and a spot of similar color over each humerus. Abdomen opaque bluish black, the first segment somewhat shining reddish; the following segments when seen obliquely, with a dense sericeous yellowish pubescence. Legs blackish brown, the base of the four anterior femora reddish yellow, the middle tarsi brownish red. Wings hyaline on the posterior part, deep brown in front; the brown borders the fifth vein behind to the base of the last posterior cell, and extends thence to the posterior angle of the first posterior cell, filling out this cell, except an oval sinus in front of the last section of the fourth vein.

Two specimens, Chapada. The male abdomen is shaped nearly as in the female, the hypopygial segment forming an apparently additional one, the sexual organs showing as an oval intercalated body below, some distance before the tip. The convexity of the third vein has a stump of a vein projecting into the first posterior cell in the female, not in the male. Whether it is a sexual or individual character it is impossible to say.

83. **Xylota genuina** n. sp.

♀.—Length 12 mm. Black, without yellow markings. Third antennal joint elongate oval, reddish brown, the intermediate ground upon which the an-

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tennæ are inserted is luteous yellow. Face in profile vertical, and straight from the root of the antennæ to the oral margin, obtusely keeled, on either side with a patch of silvery gray dust. Front opaque on the upper part, yellowish dusted across the middle. Mesonotum opaque, an intra-humeral, and a slender, interrupted sutural band, yellow pollinose. Scutellum thinned at the tip, and with eight or ten small, but distinct, spinous bristles on its margin. Abdomen opaque; first segment, lateral margins of the second, anterior angles of the third, and the fourth wholly, moderately shining greenish metallic. Hind femora moderately thickened, with numerous spines below, and a patch of short silvery pile in front toward the base; hind coxæ with a small, acute, spinous tubercle. Wings tinged with brownish, more strongly distally in front, the stigma elongate brown; third vein gently curved backward.

One specimen, Rio de Janeiro.

84. **Syritta americana** Schiner.

Three male and one female specimens from Rio de Janeiro and Chapada are probably this, but the males differ from the description in having a broad, narrowly interrupted, yellow abdominal band; the first three joints of the four anterior, not the hind, tarsi are very light yellow, and the marginal cell of the wings from beyond the auxiliary vein is filled out with deep brown. The known variations in *S. pipiens* are such that I would not consider these differences (Schiner may have overlooked the brown marginal cell) specific, without further proof. The female differs in having no yellow on the abdomen, the opaque second and third segments showing shining metallic places to correspond to them; my single female also has a shining black spot above the oral margin. The third antennal joint is fully twice as long as the first two together.

85. **Sterphus cœrulius** Rondani (*Xylota*).

S. antennalis Philippi.

I will notice here a specimen of this species kindly sent me by Mr. Roeder, who called my attention to the above synonymy, which I can corroborate. The male hind coxæ have a long slender spur beneath. The specimen is from Chili.

CERIOGASTER gen. nov.

Allied to *Xylota*, the face carinate and the abdomen much contracted on the basal segments. Head flattened; face short, in profile gently convex. First two joints of the antennæ short, third elongate oval. Eyes bare, subcontiguous in the male, in the female the front narrowed above. Antennæ inserted near the middle of the

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eyes in profile. Scutellum small, somewhat thinned. Abdomen contracted on the basal segments, the greatest width attained on the fourth; convex transversely. Hind femora much thickened in both sexes, with bristly spines below; front tarsi elongate and flattened in both sexes. Wings folded in repose; neuration as in *Xylota;* anterior cross-vein oblique, joining the fourth vein a little before the middle of the discal cell.

In addition to the species described below, the genus will probably include *Xylota coarctata* Wied.

86. **Ceriogaster foscithorax** n. sp.

♂ ♀.—Length 7–8 mm. Face, frontal triangle, and vertical triangle (except the ocelligerous tubercle) with a golden sheen; a median stripe and a stripe on the cheeks shining black; in the female the pollen of face and front is of a lighter color, with a narrow opaque band on the upper part of the front. Antennæ yellowish brown. Thorax opaque black; mesonotum with two narrow, golden opaque bands, one toward the front margin, the other on the suture, and both interrupted in the middle; a small narrow spot of the same color on the posterior margin of the mesonotum. Scutellum opaque black, the margin more or less metallic. Abdomen moderately shining black; the fourth segment bright brassy metallic, thickly clothed with short golden pile; in the female the first segment on the sides, and the third, except a large triangular spot behind, metallic green, the black opaque, and the second segment in front with two reddish spots. Legs: femora mostly black, the four hind tibiæ and tarsi deep red or pitchy; the front tibiæ distally and front tarsi deep opaque black. Wings clouded with blackish distally, the stigma deep brown.

Two specimens, Corumbá and Rio de Janeiro.

CERIA.

TABLE OF SPECIES.

1. Antennal process as long as first joint of antennæ (red species with yellow markings)..... **Lynchii** n. sp.
   Antennal process one-half or one-third as long as the first joint..... 2.
2. Second segment of abdomen long and slender, only a little dilated behind (black with yellow markings)..... 3.
   Second segment narrow in front, of nearly the full width of abdomen behind; not elongate..... 4.
3. Second joint of antennæ longer than the first, third short... **Sackenii** n. sp.
   Second joint shorter than the first; yellow stripes of face slender. **Mikii** n. sp.
4. Abdomen red throughout; thorax black..... **Brauerii** n. sp.
   Abdomen black, with or without bands..... 5.

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5. Dorsum of thorax with conspicuous light yellow pollinose stripes; abdomen banded; middle tibiæ of male with a distal brush of hair. **Roederii** n. sp.

Dorsum of thorax and the abdomen uniformly black.....6.

6. Middle male tibiæ with brush of hair on inner distal part; abdomen elongate ovate; face with two inconspicuous luteous stripes.....**barbipes** Loew.

Middle male tibiæ simple.....7.

7. Face with four slender yellowish or whitish stripes; sides of metanotum with slender yellow stripe; wings in front deep brown, towards the end yellow. **Wulpii** n. sp.

Face with two stripes, no metathoracic stripes, wings more uniform along the front border; second segment of abdomen more cylindrical, not so much dilated distally.....**Bigotii** n. sp.

87. **Ceria Lynchii** n. sp.

♂.—Length 15 mm. Face yellow, a median stripe, a vittula on each side, and a stripe from the lowest part of the eye to oral margin, ferruginous red; vertex reddish yellow, the lateral orbits golden pollinose; occiput in the middle broadly black. Frontal process long and slender, longer than the first joint of the antennæ, red. First joint of the antennæ black, a little longer than the second; second joint black, or brownish black, a little longer than the third; third wholly red; style elongate, slender, white. Mesonotum red; on the posterior half a very large triangle, its apex in front and with a slender brown streak in its middle, a stripe on each side from the suture to post-alar callosity, a triangular spot on each side in front of the suture, contiguous with a spot on the humeri, yellow; just above the supra-alar yellow stripe, an equal black one; on each side of the middle a golden pollinose stripe, reaching about as far as the apex of the posterior triangle. Pleuræ chiefly yellow, with four or five slender, vertical, blackish or brown stripes. Scutellum light yellow, the base very narrowly black; metanotum light yellowish gray pollinose. Abdomen not broad, deep ferruginous in color, the first segment with a posterior black band, the second more yellowish on the sides in front; the second segment is longer than the third, and about as long as the fourth, it is much contracted near the anterior end, but not cylindrical, its posterior side broad, nearly the full width of the abdomen. Legs yellowish red, the basal two-thirds of the femora black, but with reddish streaks. Wings brownish yellow along the front margin; the basal posterior part also tinged with the same color.

One specimen, Chapada, June. Dedicated to Dr. Enrique Lynch Arribálzaga, of Argentina.

88. **Ceria Sackenii** n. sp.

♂.—Length 14—15 mm. Face black, lightly dusted; a broad, somewhat triangular, stripe on each side, nearly confluent above with a large orbital spot and a spot on each side of the antennal process, confluent with the frontal orbital margin, yellow; cheeks black, shining behind, the posterior oral margin with a yellow spot. Vertex swollen, yellow; the posterior orbits golden yellow pollinose. Frontal process reddish yellow, or yellowish red, about half the length of the first antennal joint. Antennæ blackish brown; the first joint at base, the distal

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part of second, and the third, deep red; second joint very distinctly longer (about a fifth) than the first, third joint not half the length of the second; arista slender, silvery white. Mesonotum brownish black, in the middle with a broad yellowish dusted stripe; the humeri, a spot at outer end of suture, continued as a narrow, interrupted, sutural, golden pollinose cross-band; a supra-alar vittula, and the scutellum, except a large transverse spot, all yellow. Pleuræ black, grayish pollinose; a vertical stripe on the mesopleuræ, nearly confluent with a sterno-pleural spot, yellow. Abdomen black, the sides and venter of the cylindrical portion of the second segment, its posterior margin and the posterior margin of the two following segments, yellow; fourth segment with a biarcuate yellowish pollinose cross-band; the second segment is nearly as long as the two following together, slender and cylindrical on the anterior two-thirds or more; the following segments form a broadly ovate mass. Legs yellow; the middle femora with a spot below, the hind femora with a broad ring, sometimes incomplete above, black; front and hind tarsi more reddish or brownish; hind tibiæ with an incomplete brown ring opposite the femoral ring. Wings hyaline, with an equal brown margin in front.

Four specimens, Chapada, November. With these males there are five female specimens that seem to be of the same species, though differing somewhat in coloration. The yellow of the face is less in extent, the spots smaller; the antennæ are darker colored; the ocelli are situated on a more or less extended blackish spot; the mesonotum is black, wholly without the yellowish dusted stripe, the spots are smaller, the supra-alar vittula, when present, very slender; the legs have more black, etc.

Dedicated to Baron C. R. von Osten Sacken, of Heidelberg, the able dipterologist.

89. **Ceria Mikii** n. sp.

♂ ♀.—Length 10—12 mm. Allied to *Sackenii*. The frontal process is shorter, the first antennal joint longer, distinctly longer than the second, the third is a half or more of the length of the third. The yellow markings of the face consist of a slender, arcuate stripe on each side, not reaching the frontal process, and two small orbital spots, the upper one opposite the base of the frontal process, confluent, in the male, with a narrow frontal orbital margin. In the female the front is black, with distinct rugosities on each side. A yellow spot on each side of the ocelli on the occipital margin. Mesonotum deep black, with a small yellow humeral spot, and another at outer end of suture; no vestige of a yellow pollinose sutural band. Scutellum narrowly yellow at base and margin. Pleuræ with a slender stripe, and a very small spot below, yellow. The abdomen is, in structure and markings, similar to that of *Sackenii*; the dilated portion rather shorter and broader. The legs are blackish brown, with the narrow base of femora, the knees and middle tarsi yellow. Wings as in *C. Sackenii*.

Two specimens, Chapada, April, November.

Dedicated to the well-known dipterologist, Prof. Josef Mik, of Vienna.

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90. **Ceria Brauerii** n. sp.

♀.—Length 18—19 mm. Face black, shining, a lightly dusted stripe on each side of the middle; a yellow stripe runs from near the middle of the facial orbit to the oral margin; oral emargination broad; an interrupted band below the ocelli, and a spot on the upper part of the facial orbit, opaque black. Ocellar callosity black, posterior orbits yellow pollinose. Frontal process slender, nearly black, the underside red; in length rather more than half of the first antennal joint. Antennæ slender, the second joint only very gradually widened; black, the style silvery; first joint a trifle longer than the second, the second longer than the third, style not elongate. Thorax black, the dorsum with a distinct yellowish pruinosity, less apparent in the middle behind and near the outer end of the suture; a small spot on the humeri, a smaller one at outer end of suture, the post-alar callositics and the narrow base and margin of the scutellum, red or yellowish. Pleuræ yellowish pruinose; a rather broad yellow stripe across the sides of metanotum; an indistinct slender reddish stripe on the mesopleuræ. Abdomen ferruginous red; second segment yellow at base, the fourth segment with an indistinct, yellowish pollinose, biarcuate, cross-band; in shape the abdomen is elongate, the third segment about square; the second segment is narrow at the immediate base, of nearly the full width of the abdomen behind, of nearly equal length with the third, shorter than the fourth. Legs brownish black, the base of all the femora red or yellow. Wings hyaline, brownish along the anterior part.

Three specimens, Chapada (March) and Santarem. The first segment of the abdomen may be blackish on the sides, and in life it is possible that the following segments may have a noticeable yellow hind margin.

Dedicated to the able entomologist, Prof. Friedrich Brauer, of Vienna.

91. **Ceria Roederii** n. sp.

♂.—Length 16 mm. Face and front black, shining, the narrow margin of frontal orbit, and a slender stripe from in front of the lower border of the eye, running to the oral margin, nearly white pollinose; on either side of the face, below the antennæ thinly grayish pollinose. Frontal process about one-third of the length of the first antennal joint. Antennæ slender, black; second joint only very gradually widened, about three-fourths the length of the first, and a fourth longer than the third; style very long and slender, cinereous. Vertex not strongly prominent; posterior orbits light yellow pollinose. Thorax black, the mesonotum but little shining, with two conspicuous, opaque, light yellow, pollinose stripes, blending with the base of a slender median triangle at the scutellar margin; a slender stripe on each side, nearly touching a narrow transverse spot from the previously mentioned stripes, and running to the post-alar callosity, of the same opaque yellow color. Pleuræ gray pollinose. Scutellum yellow, shining; metanotum light golden. Abdomen elongate, narrow, black, moderately shining; second segment yellow in front; second, third and fourth with a posterior yellow margin, and a median, narrow (very narrow on the second),

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light yellow, opaque, pollinose cross band, interrupted in the middle by a slender line, that of the fourth segment is gently oblique on each side; second segment about as long as the third, very narrow in front, of nearly full width behind. Legs black; a small ring or spot at the base of the femora; middle tibiæ on distal inner third or half with a tuft of yellowish brown hair, continued more yellow and shorter on the metatarsi. Wings nearly hyaline, yellowish and brownish clouded in front; the stigma and a narrow cloud on the distal section of the third vein brown.

One specimen, Chapada. This is the handsomest species of the genus that I have yet seen.

Dedicated to the well-known dipterologist, Mr. Victor von Roeder, of Hoym, Germany.

92. **Ceria barbipes** Loew.

♂ ♀.—Length 14 mm. In structure like *C. Roederii*, the style less elongate. Black, the thorax and abdomen without markings, except that the base of the second segment is reddish. Face with two inconspicuous yellowish or reddish stripes converging to the oral margin. Wings dark brown in front, lighter toward the tip. Abdomen with fine whitish, close-lying pubescence. Middle tibiæ of the male with a brush of long yellowish brown hair on the distal half, continued somewhat on the metatarsi.

One male and two female specimens from Chapada (November) agree well with Loew's description. The female middle tibiæ have no brush of hair at the end.

93. **Ceria Wulpii** n. sp.

♂ ♀.—Length 12—14 mm. Black, scarcely shining. Face and front shining, the former lightly dusted below the antennæ, and with four slender or luteous stripes, the one each side from near the middle, gently converging to the oral margin, the other, from the lower border of the eye to the oral margin. Frontal process black, or reddish black, less than half the length of the first antennal joint. Antennæ black, the third joint dark brownish red; second joint distinctly shorter than the first, and a little (perhaps a fourth) longer than the third; style moderately elongate. Thorax deep black, not shining; a slender, transverse, yellow stripe on the sides of the metanotum, and the narrow base and margin of the scutellum. Abdomen deep black, not shining; second segment yellow at the narrow base, the following segments with fine yellow pubescence; second segment nearly the full width of abdomen behind, distinctly longer than the third. Legs black, the tibiæ and tarsi sometimes perceptibly reddish. Wings nearly hyaline on the posterior part, along anterior part on basal half deep brown, on distal part yellow, on basal posterior portion strongly tinged with brownish.

One male and six female specimens, Chapada (January, November) and Rio de Janeiro (November). The female of this species will be distinguished from the female of *barbipes* by the additional stripe of the face, the yellow of the distal anterior portion of the

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wings, by the shorter, more broadly oval, distal portion of the abdomen, which in all the specimens forms a strong angle with the second segment, directed downwards, etc.

Dedicated to the dipterologist, Mr. F. R. v. d. Wulp, of Hague, Holland.

94. **Ceria Bigotii** n. sp.

♂ ♀.—Length 10—11 mm. Closely allied to *C. barbipes*, but is smaller, the style of antennæ is shorter, the abdomen is much more contracted on the second segment, and less expanded distally, the distal portion is more shining and not noticeably with pubescent, and the male wholly lacks the brush of hairs on the middle tibiæ.

Two specimens, Chapada. The simple middle tibiæ will at once distinguish the male of this species from that of *C. barbipes*. In the female of *C. barbipes* the second segment of the abdomen has three sides straight and of nearly equal width, with a short cylindrical stem; in *C. Bigotii* the cylindrical portion forms nearly half the length of the segment, and its posterior side is distinctly less in width than that of the next segment. The antennal styles in the female do not differ much. The legs in my specimens are deeply tinged with red.

Dedicated to Mr. J. F. M. Bigot, of Paris.

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Additions to the Catalogue of South American Syrphidæ, Trans. Amer. Ent. Soc. xiii, 308–324.

Microdon cyaneus Perty, Delectus, etc.—Brazil.

fulgens Wiedemann, Auss. Zw. Ins. ii. 82; Williston, Synopsis N. A. Syrphidæ, 11; Macquart, Dipt. Exot. 1er Suppl. 122.—N. and S. America.

Syrphus albitarsi, excavatus, albiventris Rondani, Dipt. Osculati —S. America.

octoguttatus Jaennicke, Neue Exot. Dipt. 90.—Chili.

similis Blanchard, Gay's Hist. fis. y pol. de Chile, vii. 410; Philippi, Verh. Zool. Bot. Gesellsch. xv. 745.—S. America.

albomaculatus Smith, Proc. Zool. Soc. Lond. 1877, 84.—Galapagos.

agonis Walker, List, etc., iii. 538.—Galapagos.

splendens Thomson, Eugenies Resa, 501.—Galapagos.

Temnocera metallorum, fulvolucus, Walker, Dipt. Saunders, 252.—Brazil.

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Eristalis decorus Perty, Delectus, etc.—Brazil.
inversus Wiedemann, Auss. Zwei. Ins. ii. 161.—Surinam.
fuscipennis Macquart, Dipt. Exot. 1er Suppl. 128, pl. xi. fig. 5.—Surinam.
pygmæus Macquart, Dipt. Exot. ii. 2, 54.—Surinam.
funescens Rondani, Dipt. Osculati, 4.—Rio Negro.
Helophilus chilensis Guerin, Iconogr. 545, pl. xcix. fig. 2.—Chili.
Dolichogyna fasciata Macq.
Helophilus Hahni Bigot, Mis. Sc. Cap. Horn, Dipt. vi. Dv. 24, pl. iii, fig. 6.

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Description of a larva of PAPILIO GUNDLACHIANUS two days previous to its transformation into a chrysalis.

BY ALBERT BONZON, of Santiago de Cuba.

The head is black. The general color of the body ashy violet, with three straight, longitudinal, black, fine lines, parallel to each other, one dorsal and the other two lateral, interrupted only in the first four segments; between the shield on the first segment (which shield is black), and the head, there is a yellowish white band, from which protrude fleshy protractile horns of an orange color, and at its extremity a white appendage of one millimeter in length. Each of the second and third segments have also four appendages curved backwards and shaped like a thorn, of white color with a black stripe in front and behind, the two central ones in each segment being five millimeters in length, and the other two a little shorter. The fourth segment has also two central appendages of five millimeters in length, and one very short one on either side. The third and fourth segments are thicker than the rest. The fifth, sixth, seventh, eighth and ninth segments have no appendages, and are exactly similar to each other, and, commencing from the black dorsal line, each half of these segments is as follows: the black dorsal line is bordered with grayish white, which is followed by a small, oblique, violet band; then another black oblique line with grayish white borders, and another violet band broader than the first; then comes the straight, black, lateral line, bordered with whitish gray, being a continuation of the same line, on which are placed the lateral appendages of the second, third and fourth segments already described, and of the tenth, eleventh and twelfth to be described later; a triangular violet space follows, then another little black oblique stripe with gray borders, another violet band followed by a line like the others, but horizontal; and then another dark band divided by a little black stripe with light borders, in the lower part of which band are situated the stigmata, which are black and of oval form, with an ash colored centre; lastly, a white band with a slight pink hue and little black stripes, which band extends from the head to the anal cover, along the side, above the feet. In the tenth, eleventh and

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thirteenth segments there is more of the white color and less of the violet than in the others; the tenth has two long appendages, one on either side of the lateral black lines, and two very small ones, one on each of the white bands; the eleventh has also two appendages on the lateral lines, but not so long as the others, and two on the white bands longer than the rest; the twelfth segment has only two on the lateral lines and shorter than the others. On the anal cover there is a black triangle. The horny feet are black, and the fleshy ones of an ashy dark violet with their extremities black, and on their upper part a small protuberance of an ash color inclining to yellow. Length of the larva is 30 millimeters.

The larva feeds on one of the Aristolochiæ. It remains about thirteen days in the pupa state.

Santiago de Cuba June 16, 1888.

Descriptions of some new or little known MICROGASTERINÆ.

BY CLARENCE M. WEED.

Soon after the publication of my "Notes on Some Illinois Microgasters,"* Mr. E. T. Cresson kindly offered to send me the Microgasterinæ in the collection of the American Entomological Society for arrangement and study, and the present paper is the result of a preliminary examination of the material therein contained.

Microplitis maturus n. sp.—Length 3.5 mm. ♂ ♀. Black; antennæ, clypeus and mandibles ferruginous; palpi light yellow; tegulæ and legs (except tarsi and posterior coxæ, which are fuscous) testaceous; anterior half of abdomen, except tergum of first segment, also testaceous. Mesonotum slightly shining, punctate. Scutellum punctate. Metanotum reticulate, with median and lateral carinæ. Tergum of first abdominal segment rugulose; remaining terga smooth and shining. Wings hyaline; veins yellowish brown; stigma, except spot on inside, darker; areolet subrhomboidal, large; ovipositor concealed.

Described from four specimens from New York and Connecticut in the collection of the American Entomological Society. The depth of coloring of the abdomen varies considerably. One of the specimens was labeled *M. maturus*, Cresson MS., and I have adopted the name thus proposed.

* Bull. Ill. St. Lab. Nat. Hist. Vol. III, Art. I, p. 1.

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Microplitis terminatus n. sp.—Length 5 mm. ♂ ♀. Black; scape, labrum, mandibles, palpi, tegulæ, legs (except posterior coxæ), ventrum and posterior half with more or less of margins of anterior half of dorsum of abdomen testaceous. Antennæ brownish, fuscous at tip, reaching slightly beyond thorax. Mesonotum opaque, punctate, with lobes well developed. Scutellum opaque, punctate. Metanotum coarsely reticulate, with prominent median and lateral carinæ. Tergum of first abdominal segment reticulate, with longitudinal median excavation. Tergum of second segment smooth and shining on anterior angles; otherwise with rather thick punctures. Remaining terga smooth. Wings subhyaline; veins yellowish brown, darker apically; stigma dark brown, with lighter spot on inside. Ovipositor concealed.

Described from five Illinois specimens in the collection of the American Entomological Society. One of these was labeled *Microgaster terminatus*, Cresson MS., and I have adopted the specific name thus proposed.

Apanteles hallii (Pack.)—*Microgaster hallii* Packard, Am. Nat. vol. xi, p. 52, 1877.—Length 3 mm. Black; antennæ piceous; mandibles and palpi dark reddish brown. Legs brownish black, posterior tibiæ slightly paler. Mesonotum slightly shining, finely punctate. Scutellum shining, nearly smooth. Terga of first and second abdominal segments shining, scabrous; remaining terga smooth and shining. Tegulæ piceous. Wings hyaline, veins brownish black, lighter apically; stigma dark yellowish brown.

Described from one of the original type specimens in the collection of the American Entomological Society. The specimen had three labels upon it: the first being "Polaris Bay, June, 1872, Bessels;" the second, "*Microgaster Hallii* Pack.;" and the third, "From Dr. Packard." The first and second I judge to be in Dr. Packard's handwriting, and the third in that of Mr. Cresson. The specimen at hand is somewhat imperfect, and the legs and wings are so compressed that I am not certain of the sex.

Dr. Packard describes the cocoon as of "the usual cylindrical shape; white."

Apanteles lunatus (Pack.)—*Microgaster lunatus*, Packard, Proc. Bost. Soc. Nat. Hist. vol. xxi, p. 28. *Apanteles lunatus* Riley, Am. Nat. vol. xvi, p. 680.—Length 3—3.5 mm. ♂ ♀. Black, palpi whitish or light brown. Antennæ piceous, almost as long as body. Legs red, coxæ black, posterior femora and tibiæ with dusky tips, tarsi also more or less dusky. Mesonotum, with scutellum, densely confluently punctured. Metanotum indistinctly reticulate, without carinæ. First and second abdominal terga rugosely punctate, and extreme base of third also slightly sculptured; remaining terga smooth and shining. Wings hyaline, iridescent; veins and stigma brown.

Described from one of the original type specimens bred from *Papilio asterias* by Dr. Riley; five others bred in Illinois from the same species by Prof. G. H. French; and two Massachusetts specimens also bred from this species.

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This insect is at times quite common in southern Illinois, and as I am informed by Prof. French, has noticeably decreased the members of the handsome butterfly upon which it preys. The cocoons are yellow, 5 mm. long by 2.2 mm. in diameter. They are spun singly upon grass blades or similar materials, and have little loose silk.

Apanteles carduicola (Pack.)—*Microgaster carduicola* Packard, Proc. Bost. Soc. Nat. Hist. vol. xxi, p. 27.—Length 3 mm. ♂ ♀. Black; palpi white; antennæ, tegulæ, labrum and mandibles piceous; tibiæ and apical half of femora of first and second legs and nearly whole of posterior tibiæ, testaceous; tarsi dusky. Wings hyaline; veins, except at base, and stigma, yellowish brown. Mesonotum somewhat shining, finely, thickly punctured. Scutellum shining, nearly smooth. Metanotum rugose, with no median carina. Tergum of first abdominal segment coarsely punctured; of second more finely punctured; remaining terga smooth and shining; ovipostor concealed.

Described from two of the original type specimens in the collection of the American Entomological Society, received from Dr. Packard.

Microgaster facetosus n. sp.—Length 3.5 mm. ♂ ♀. Black; antennæ (especially beneath), labrum and mandibles ferruginous; palpi whitish; four anterior legs light honey yellow; posterior legs honey yellow, with basal half of coxæ, tips of femora, apical third of tibiæ and tarsi entirely, fuscous; basal half of ventrum of abdomen, with margins of three anterior terga and narrow transverse band just behind posterior border of third tergum light yellow. Antennæ as long as body. Mesonotum slightly shining, scabrous. Scutellum punctate. Metanotum reticulate, with median carina. First, second and base of third abdominal terga rugulose; margins soft and light colored; remaining terga smooth and shining. Wings hyaline; tegulæ and wing veins yellowish brown; stigma darker; radius indistinct; areolet triangular. Posterior coxæ two-thirds as long as abdomen.

Described from two Illinois specimens in the collection of the American Entomological Society.

A specimen from New Jersey resembles this species very much, but differs so in its darker color, reticulate scutellum, etc., that I prefer to leave it for the present without referring it to this species or describing it as distinct.

Microgaster zonaria Say.—Length 2.5 mm. ♂ ♀.—Black; scape beneath, clypeus, labrum and mandibles, legs, except claws and posterior tarsi (which are fuscous) ventrum of abdomen and band on its dorsum (terga two and three in male, and same with more or less of four in female) honey yellow; palpi whitish; tegulæ and insertion of wings straw yellow. Antennæ brownish; as long as body. Mesonotum shining with minute, regular punctures. Scutellum shining, sparsely punctured. Metanotum shining, punctured, with indistinct carinæ enclosing a broadly triangular place on middle. Tergum of first abdominal segment deeply punctured; remaining terga smooth and shining; sheath of ovipositor black, slightly more than half as long as abdomen; ovipositor

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honey yellow. Wing veins (except at base) and stigma yellowish brown; radius indistinct; areolet very minute, triangular. Posterior coxæ subcylindrical, nearly as long as abdomen.

Described from seven specimens (two ♂, five ♀) from Massachusetts in the collection of the American Entomological Society.

At first sight this species has much the appearance of an *Apanteles*, as the areolet is so minute as to be indistinguishable without considerable magnification.

A table of the species of VESPA found in the United States, with descriptions of two new species.

BY JOSEPH Mc FARLAND.

I.—Eyes not extending to base of mandibles.
  Clypeus longer than broad.
    Species colored black and white.
      Scape white anteriorly ..... **maculata** Linn. / **arenaria** Fabr.
    Species colored black and yellow.
      Scape yellow anteriorly ..... **diabolica** Sauss. / **infernalis** Sauss.

II.—Eyes extending to base of mandibles.
  Clypeus as broad or broader than long.
    Species colored black and white.
      Antennæ all black ..... **scelesta** n. sp.
    Species colored black and yellow.
      Antennæ all black ..... **germanica** Fabr. / **vulgaris** Linn. / **communis** Sauss.
      Scape yellow anteriorly ..... **vidua** Sauss. / **pennsylvanica** Sauss. / **rufa** Linn. / **occidentalis** Cresson.
      Mesothorax with two longitudinal stripes ..... **cuneata** Fabr. / **carolina** Drury. / **sulphurea** Sauss. / **bistriata** n. sp.
    Species tawny and ferruginous; size large.
      Antennæ tawny beneath ..... **crabro** Linn.

On account of insufficient description, *V. borealis* Kirby (Fauna Bor. Amer. 4, p. 264) is not incorporated in the table.

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V. bistriata n. sp.

♀.—Black marked with yellow, very finely punctured, and clothed with a sparse black pubescence. Head black, subtriangular, with a somewhat triangular spot—the apex below—between the antennæ; a tiny spot between the above and the ocelli; a spot in the sinus of the eye confluent with a narrow orbital margin; cheeks connecting above the orbit with its narrow internal margin; clypeus, excepting a small, irregular black spot; and the mandibles, excepting a narrow margin, yellow. Antennæ black, the scape marked anteriorly by a yellow line. Flagellum black. Thorax: collar yellow, giving off an anterior, pointed, descending process. Scutum with two yellow longitudinal lines. Scutellum marked with two large lateral yellow spots. Post-scutellum yellow, narrowly interrupted with black. Metathorax black, each side having a superior, small, circular, yellow spot, and an inferior, large, subquadrate yellow spot. Sides of thorax beneath the wings marked by an oblique yellow stripe and two yellow spots. Tegulæ yellow, with a ferruginous spot. Wings hyaline, nervures brown. Legs yellow, the coxæ and femora marked above with black; tarsi ferruginous. Abdomen: first segment black, with a narrow, interrupted, yellow basal border, confluent with two lateral, basal spots, and at the sides with a narrow, nearly interrupted apical yellow margin. Second segment black, marked about the middle with a broad, broken yellow band. This segment is more or less broadly bordered with yellow, having two rounded indentations, and confluent laterally with the broad interrupted band marking the middle of the segment. Third segment yellow, notched basally with black, and having two lateral black spots. Fourth segment yellow, less deeply notched with black and having two black spots. Fifth segment yellow, scarcely indentated with black anteriorly, and having the two lateral spots; anus yellow, with a longitudinal black stripe. Venter yellow, with a black spot on each side of the second segment. Length 9 lines. Expanse of wings 15 lines.

Hab.—North America. Locality unknown.

One ♀ specimen in the collection of the American Entomological Society.

This species is distinguished from *V. cuneata* Fabr. by its larger size and by the different ornamentation of the abdomen.

V. scelesta n. sp.

♀.—Black, finely punctured and covered with long black hairs. Head black, subtriangular, slightly longer than broad. A bilobed spot between the antennæ, a narrow line in the sinus of the eye, a linear spot behind each eye superiorly, clypeus except a central bilobed, trefoil or lozenge-shaped black spot, and mandibles, except the edges, which are black, white. Antennæ entirely black. Thorax black; collar, a spot beneath the wing and two lateral spots on the scutellum white. Post-scutellum and metathorax black. Tegulæ white, daubed with ferruginous. Wings hyaline, nervures brown. Legs: coxæ, trochanters and femora, except tips, black; tips of femora, tibiæ and tarsi honey yellow. First segment of abdomen entirely black. Second segment with a very narrow interrupted white border, becoming wider laterally. Third segment black, broadly bordered apically with white, having three indentations. Fourth and fifth segments black, very broadly bordered with white, with two rounded lateral indentations;

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anus black, with a small white spot on each side. Venter black, the second, third, fourth and fifth segments bordered with white, widely interrupted medially, each side. having a prominent rounded indentation.

♂.—Head broader than long, abdomen narrow and elongate. All the abdominal segments bordered with white, the border of the first segment being narrow and interrupted.

Var.—One specimen has a narrow white line on the scape of the antennæ and a black spot on the mandibles.

☿.—Resembles female, but the first abdominal segment has a narrow, interrupted border of white, the other segments being more narrowly bordered than in the ♀, and the indentations not so prominent.

Var.—One specimen has a small white spot on the scape of the antennæ. Length 8½ lines.

Hab.—Pennsylvania, Virginia, New Hampshire, Colorado, Montana, Maine, Washington Territory, Massachusetts.

Ten specimens, ♀, ♂, ☿. Collections of American Entomological Society, Agassiz Museum and J. McFarland.

This species is readily distinguished from *V. arenaria* Fabr. and *V. maculata* Linn. by the approximation of the eyes and mandibles, and the entirely black antennæ (see table).

Notes on some types of North American CERAMBYCIDÆ in the British Museum.

BY C. J. GAHAN, London, England.

Through a false impression, by which Dr. Horn regarded the *Liopus biguttatus* of LeConte as specifically identical with the *Graphisurus pusillus* of Kirby, confusion still exists in the nomenclature of the North American *Acanthocini*.

Graphisurus pusillus Kirby is, as I believe Dr. Horn was the first to discover, a true *Acanthocinus*, and is synonymous with *A. obsoletus* Oliv. Kirby's type in the British Museum collection proves this, and consequently his genus as such cannot stand. The name *Graphisurus* must, however, still be retained for the genus, the characters of which, as LeConte and Lacordaire gave them, apply to the two species—*triangulifer* Hald. and *fasciatus* De Geer, and the name *Urographis*, employed by Dr. Horn for these species must properly

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be placed as a synonym of *Graphisurus* Lec. It becomes necessary to give a new name to the genus which was fully defined by Dr. Horn under the name Graphisurus (Trans. Amer. Ent. Soc. vol. viii, p. 129), and of which the type is *biguttatus* (Liopus) Lec. This genus I propose to call *Ceratographis*, and in order to show the change of nomenclature more clearly I tabulate the genera and species with their new synonyms as follows:

GRAPHISURUS Lec. Lacord.
Urographis Horn.
G. triangulifer Hald.
G. fasciatus De Geer.

CERATOGRAPHIS n. g.
Graphisurus Horn.
C. biguttata (*Liopus*) Lec.

ACANTHOCINUS Steph.
Graphisurus Kirby.
A. obsoletus Oliv.
pusillus (*Graphisurus*) Kirby.
A. obliquus Lec.
A. spectabilis Lec.
A. nodosus Fabr.

Along with Dr. Horn, who has very kindly given me valuable assistance in naming North American Longicorns, I have been looking into the species of the genus *Mecas* in our Museum collection. We find that the *Saperda cana* of Newman is synonymous, not with *Mecas pergrata* Say, as Dr. Horn's list has it, but with *Mecas saturnina* Lec. Newman's name is the older.

As synonymous with *Mecas inornata* Say we place *Mecas* (Saperda) *cinerea* Newm., and *Mecas senescens* Bates. The synonymy of these two species, which were shown by Blanchard (Ent. Amer. vol. iii, p. 86) to be distinct, is then as follows:

Mecas inornata Say.
cinerea Newm.
senescens Bates.

Mecas cana Newm.
saturnina Lec.

Additional Notes.

BY GEORGE H. HORN, M. D.

At the time of my first visit to London the type of *Graphisurus pusillus* could be but imperfectly studied. The type proves to be a very small *Acanthocinus obsoletus*, and Kirby's description applies with great accuracy to *Liopus biguttatus*. Not desiring to perpetuate an error, Mr. Gahan, at my request, after his own study, has prepared the note which precedes.

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The specimens which served as the types of *Mecas inornata* Say and *M. saturnina* Lec. and which formed the basis of my study of that genus are identical. On going over the material which had accumulated in the meantime Mr. Blanchard found that two species were present in both sexes. It was thought better that one form should bear the Say name and the LeConte name retained for that bearing the autograph label of LeConte as follows:

M. saturnina Lec.—Claws moderately deeply cleft, the inner division acute.

M. inornata Say.—Claws more deeply cleft, the inner division broad and lobe like.

In the light of these studies the species described by Newman were found to be as indicated by Mr. Gahan.

The opportunity kindly permitted by the curators of the British Museum have enabled me to study several species of Leptura with results different from those hitherto published.

L. nana Newm.—Antennæ always piceous. Anterior femora and base of middle yellowish. Terminal ventral segment of female simple.

This species varies in color. The upper surface is often entirely piceous. By far the larger number I have seen have a reddish thorax, constituting the variety *hæmatites* Newm. One specimen before me is piceous with the head reddish yellow.

L. exigua Newm.—Antennæ piceous, the basal joint yellow. Anterior femora entirely, the middle and posterior yellow at base. Terminal ventral segment of female with a slight tuberosity near the apical margin.

This species may have the thorax entirely piceous, usually it has the entire margin yellow. The disc is also more densely punctured than in *nana*, while the form of the thorax is shorter and broader. *L. saucia* Lec. is synonymous.

My attention was called to the structure of the last ventral of the female by Dr. John Hamilton, to whom I have often acknowledged my indebtedness for useful observations.

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Notes on some North American species of HALTICINÆ (Group Monoplati).

BY MARTIN JACOBY, London, England.

At the suggestion of Dr. Horn, during his recent visit in London, I have examined several genera of Halticinæ of the group with globular claw-joints, described by Clark in his monograph and inhabiting North America, of which the types are contained in the British Museum. I give here the results of my examination.

HAMLETIA Crotch.

Pachyonychis Clark.

The type of this insect, of which a single specimen (unfortunately not in good condition) is contained in the Museum collection, although belonging to the section of Halticinæ with globular claw-joints, cannot find its place at all amongst the *Monoplati*, since its elytra are not punctate-striate, but irregularly punctured, and its anterior coxal cavities are not closed, but open; the antennæ and the posterior claws are entirely or partly wanting, but have been described by Clark. It is evident that a *Pachyonychis paradoxus* and a *Pachyonychus paradoxus* cannot both be retained, and that, therefore, Crotch's name of *Hamletia* should be restored for this species; the latter is, however, not of a dark olive green, but of dark blue color, and should find its place near *Physodactyla* Chap. and *Eutornus* Clark.

PACHYONYCHUS Chev.

Pachyonychus paradoxus Melsh.

This species is a true representative of the group, and was evidently unknown to Clark. Crotch has given a renewed description of the insect, which has nothing at all in common with Clark's preceding species; neither does it belong to *Phædromus*, as mentioned by LeConte (Classific. N. Am. Coleopt. p. 350).

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PHÆDROMUS Clark.

Phædromus Waterhousei Cl. Cat. Haltic. p. 68.

The type now in the British Museum has no locality attached to it, and, as the insect is of comparatively large size and unknown to Dr. Horn, as it was likewise to Crotch, considerable doubt is attached as to the locality (Carolina) given by Clark being correct. The species has a flavous thorax, not impressed with a basal transverse groove, differing in this respect from *Pachyonychus* and the elytra are black, shining, and very finely punctate-striate.

I need only add here, that, although the structure of the anterior coxal cavities in regard to their open or closed state, have been employed by Chapuis as the preliminary division of the *Galerucidæ*, this character must be used with caution, since instances occur in which the same species possesses closed cavities in one specimen and open ones in others. Yet these cases are exceptions, and it seems that the closed cavities in the group of *Monoplati* go hand-in-hand with punctate-striate elytra (as already pointed out by the late von Harold), and, as already remarked, *Hamletia* must be removed from this group of Halticinæ.

Supplementary Notes.

BY GEO. H. HORN, M. D.

As correctly shown by Mr. Jacoby, *Hamletia* (*Pachyonychis* ‡ Clk.) cannot be referred to the Monoplati, but to the Œdionychi as defined by Chapuis and adopted in the Class. Coll. N. A. pp. 349 and 351. The posterior tibiæ have a sinuation on the posterior edge above the insertion of the tarsi as in the genera Physodactyla and Œdionychis. The penultimate joint of the maxillary palpus is, at apex, about as broad as long as in Physoma from Œdionychis and Physodactyla it differs in having absolutely simple claws and the head not deeply inserted in the thorax.

At the time of the preparation of the Classification the species was unknown to us. Since then a good specimen has come to me and the antennæ are seen to be parti-colored, the four basal joints yellowish testaceous, the next four black and the three terminal yellowish white.

As the name *Pachyonychus paradoxus* had been already used by Melsheimer, the practically identical name given by Clark for the

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insect at present under consideration was dropped by Crotch and Hamletia proposed.

Hamletia dimidiaticornis Crotch, Proc. Acad. 1874, p. 59.
Pachyonychis paradoxus ‖ Clark, Catal. Haltic. B. M. p. 61, pl. 2, fig. 7.

The first use of the name in description of *Pachyonychus paradoxus* was by Melsheimer, Proc. Acad. iii, p. 163, and as remarked by Crotch, the name must remain. The species was certainly not known to Clark, and Mr. Jacoby is the first authority who has seen the insect.

Pachyonychus Mels. is a true representative of the Monoplati. The maxillary palpi are short and stout, thicker externally, the terminal joint obtusely conical. The posterior tibiæ have two well-defined ridges along the posterior edge which are straight and not denticulate. The tarsal claws are appendiculate at base. The thorax is transverse, the anterior angles dentiform, the side not angulate, the disc deeply transversely impressed in front of the base.

From these characters, supplementary to those given by Crotch, the genus will be seen to be related to *Cerichrestus*. As the latter has a double spur to the posterior tibiæ and the surface of body pubescent, while there is but one short spur in *Pachyonychus* and the surface glabrous, the two genera are abundantly distinct.

The species on which Phædromus has been founded has never been seen by me in any American collection. It is of oblong, parallel form, thorax yellowish, elytra nearly black. It differs structurally from the other two genera, Pachyonychus and Hypolampsis, in having slender maxillary palpi.

Removing Hamletia (*Pachyonychis* ‡ Clark), as suggested, to the Œdionychi, the genera of Monoplati, on p. 350 of the Classification of the Coleoptera of N. A. may be modified as follows:

Maxillary palpi slender; posterior tibiæ with a double terminal spur.
Phædromus.

Maxillary palpi stouter to tip; posterior tibiæ with a single terminal spur.
Posterior tibiæ longitudinally bicarinate, thorax transversely impressed in front of base; body glabrous..... **Pachyonychus.**
Posterior tibiæ feebly unicarinate; thorax not impressed; body hairy.
Hypolampsis.

The species at present included in Œdionychis must be separated into several genera already described, and will remain for a future study. The notes already given will enable Hamletia to be separated from Œdionychis as at present constituted.

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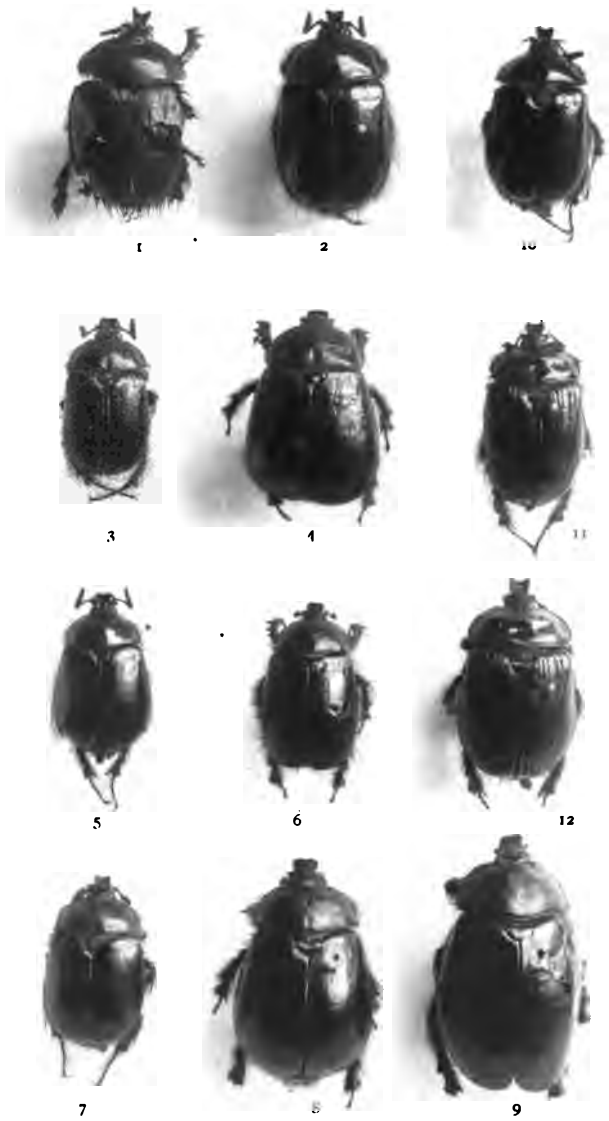
PLEOCOMA.



1-P. fimbriata (*type*)
2-P. fimbriata
10-P. conjungens
3-P. Behrensii
4-P. Behrensii ♀
11-P. Ulkei
5-P. Rickseckeri
6-P. Rickseckeri ♀
12-P. Staff
7-P. hirticollis
8-P. hirticollis ♀
9-P. hirticollis ♀

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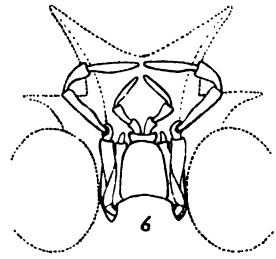

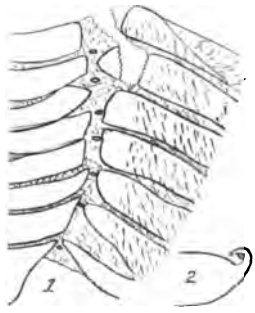

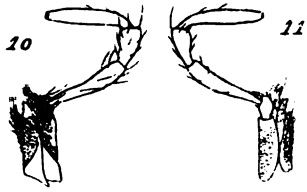

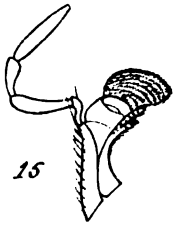

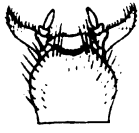

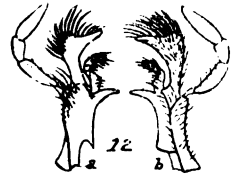

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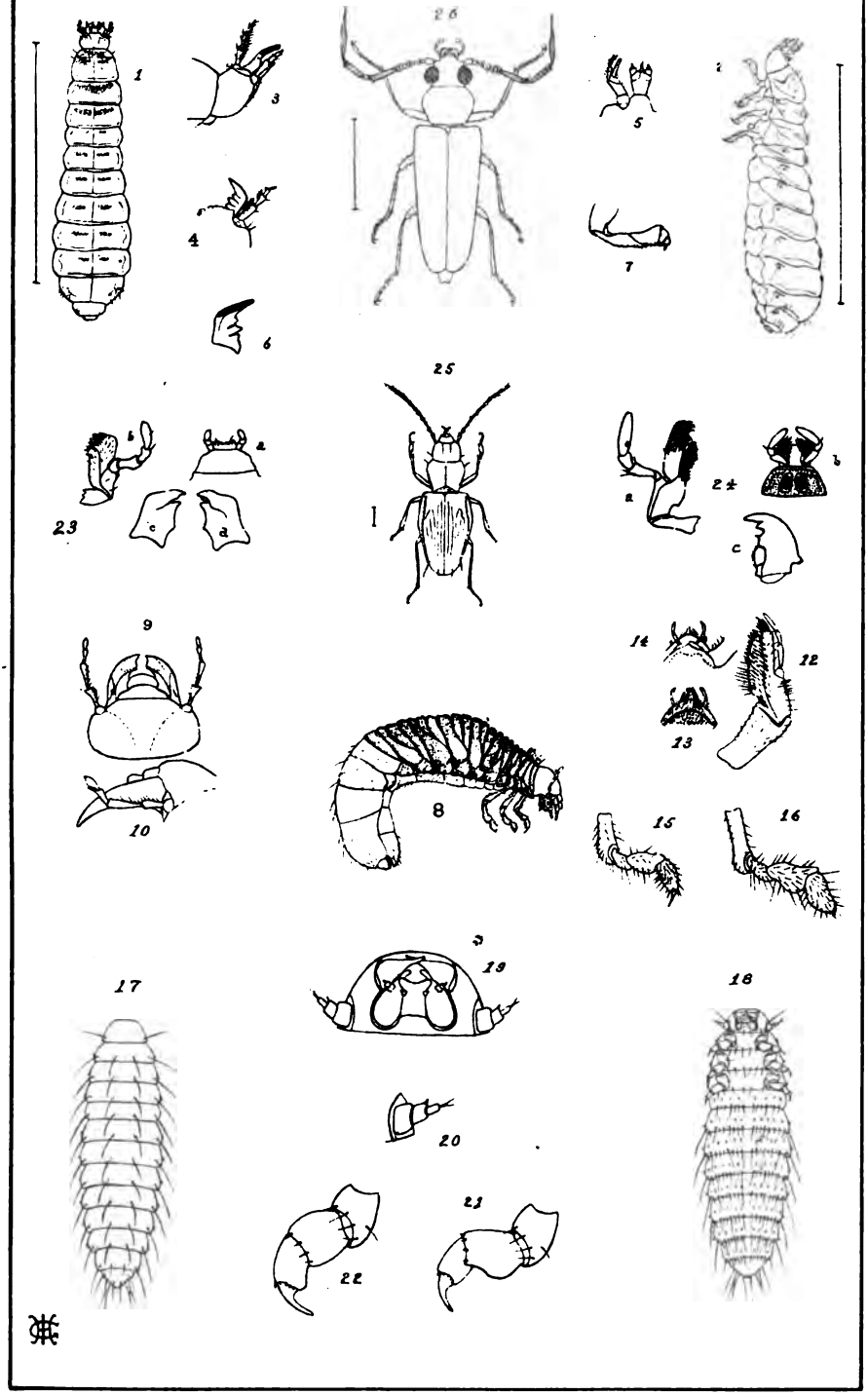

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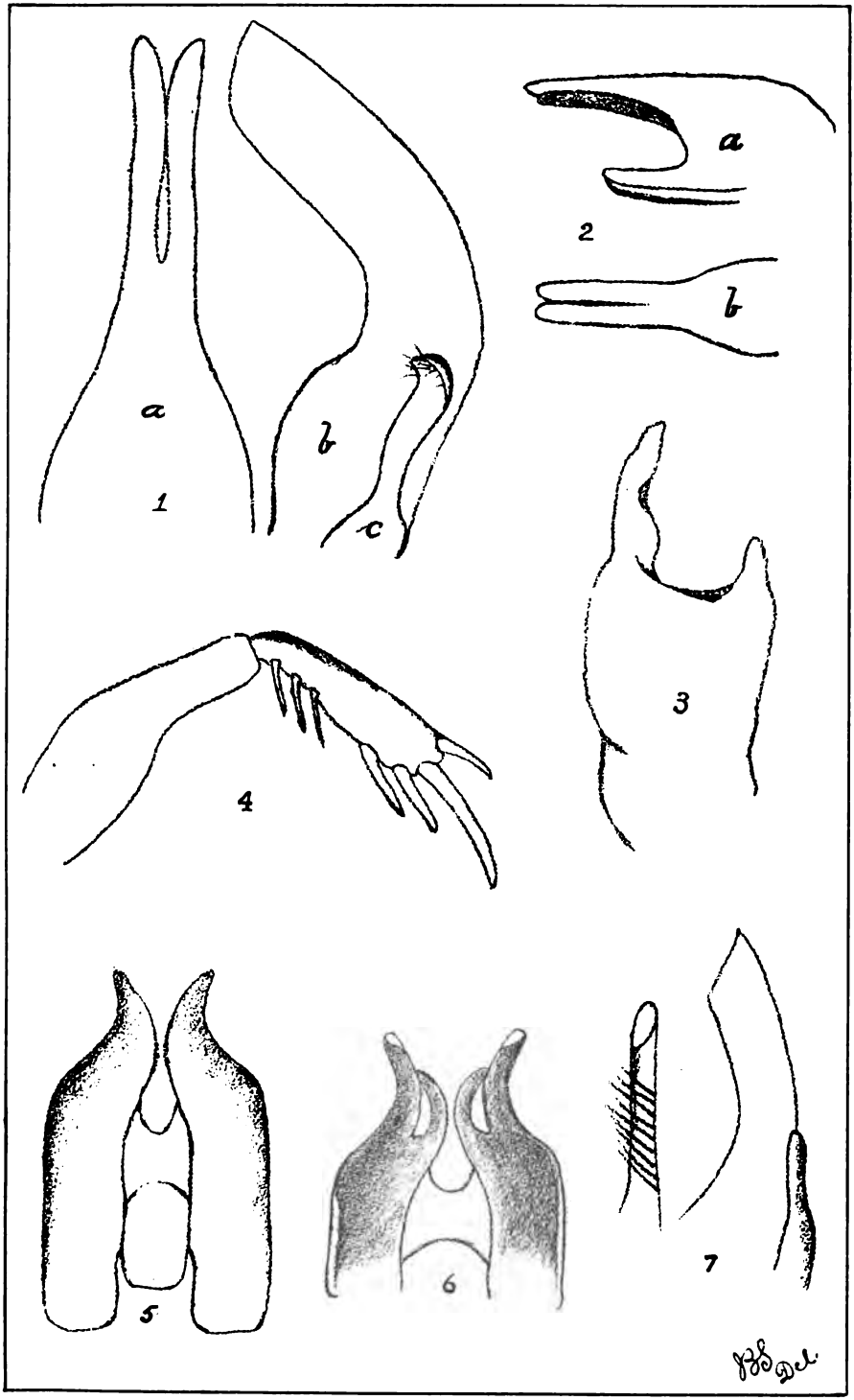

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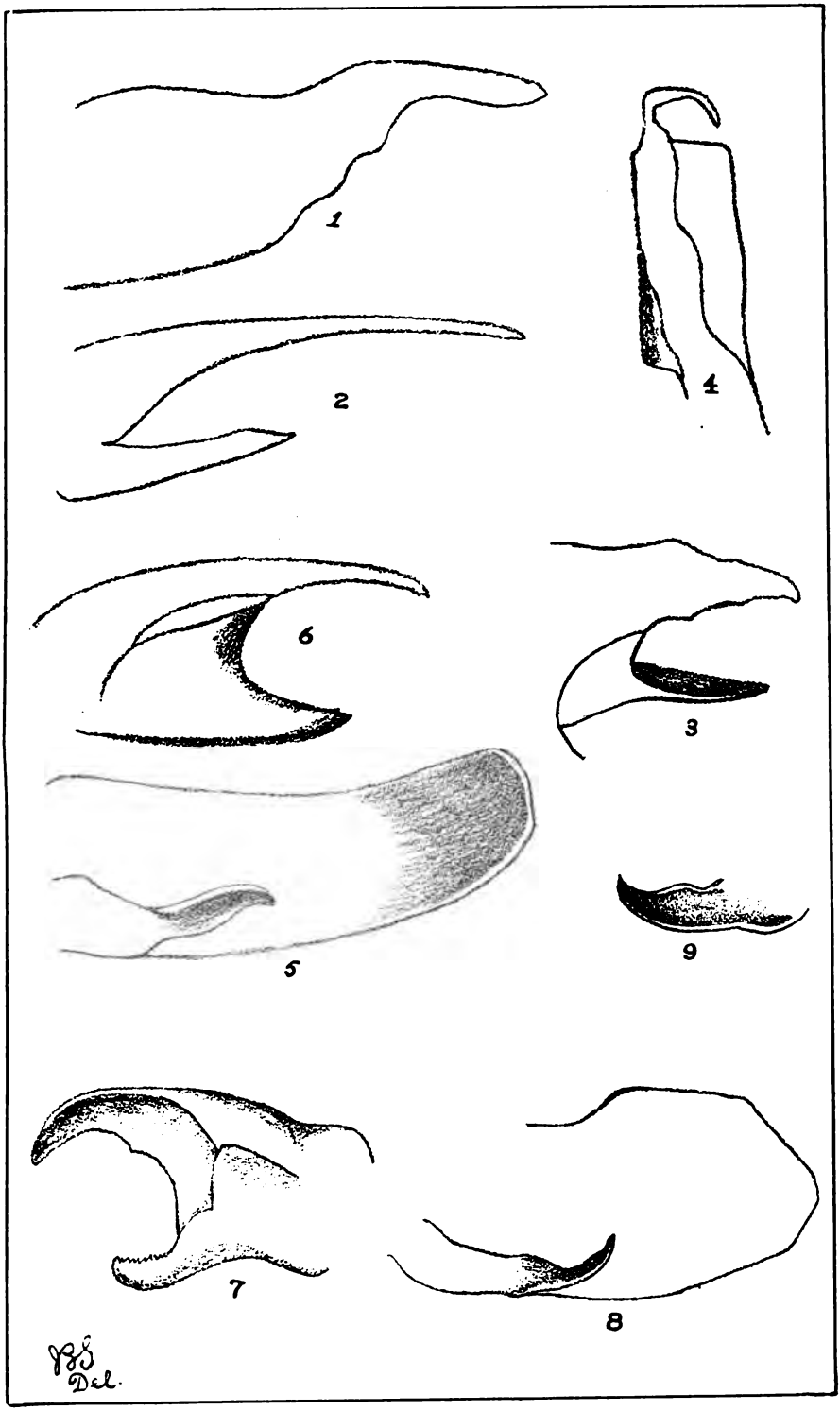

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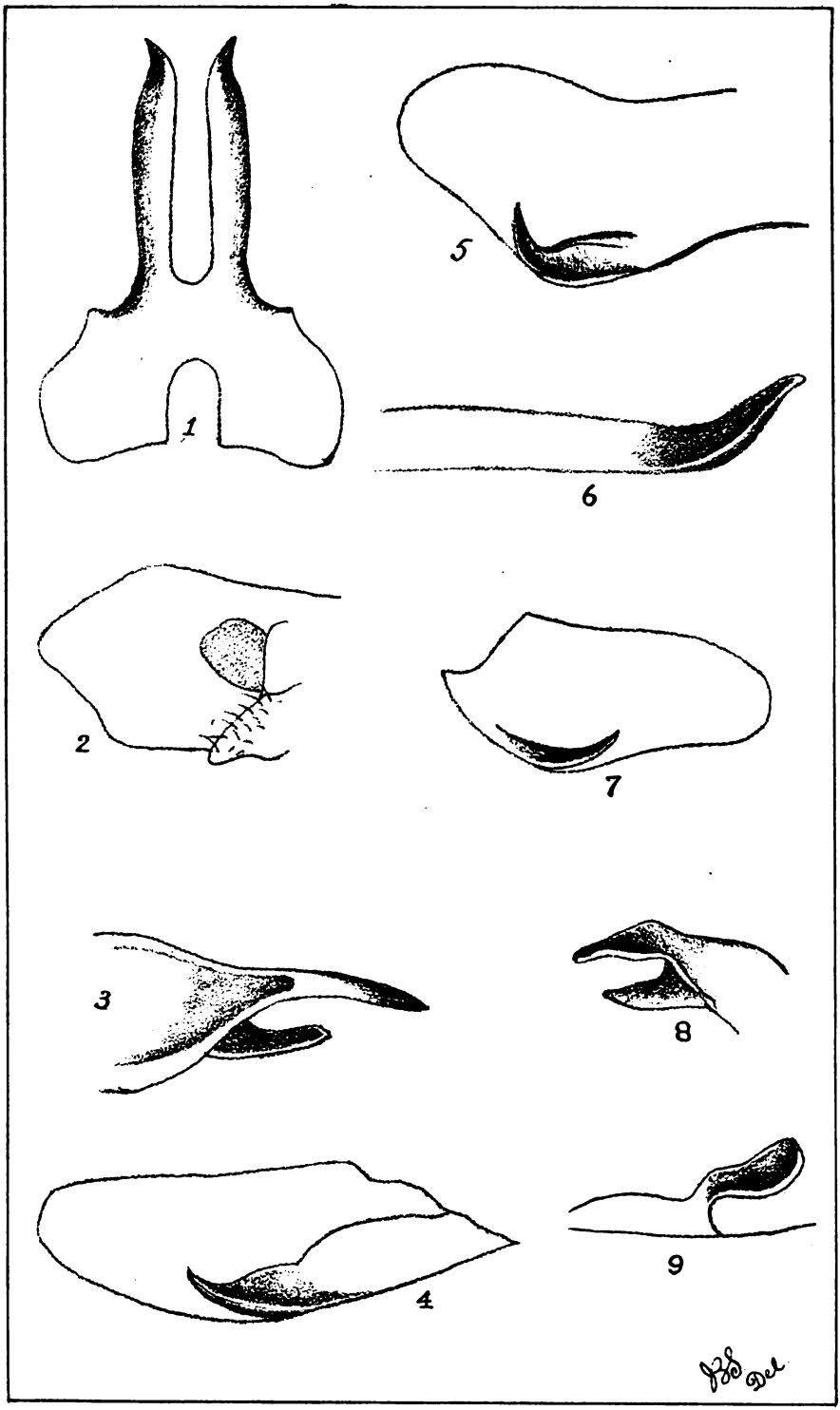

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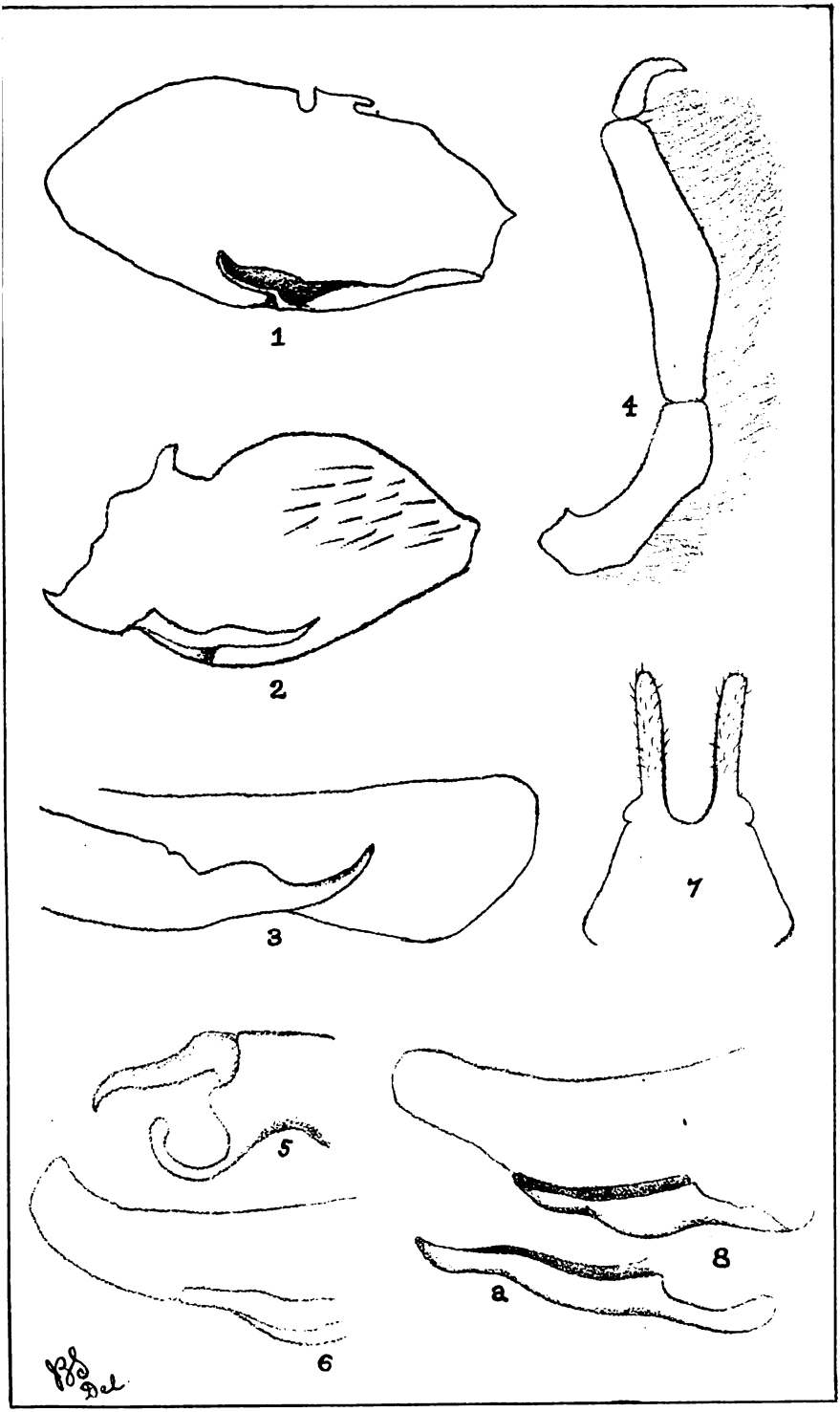

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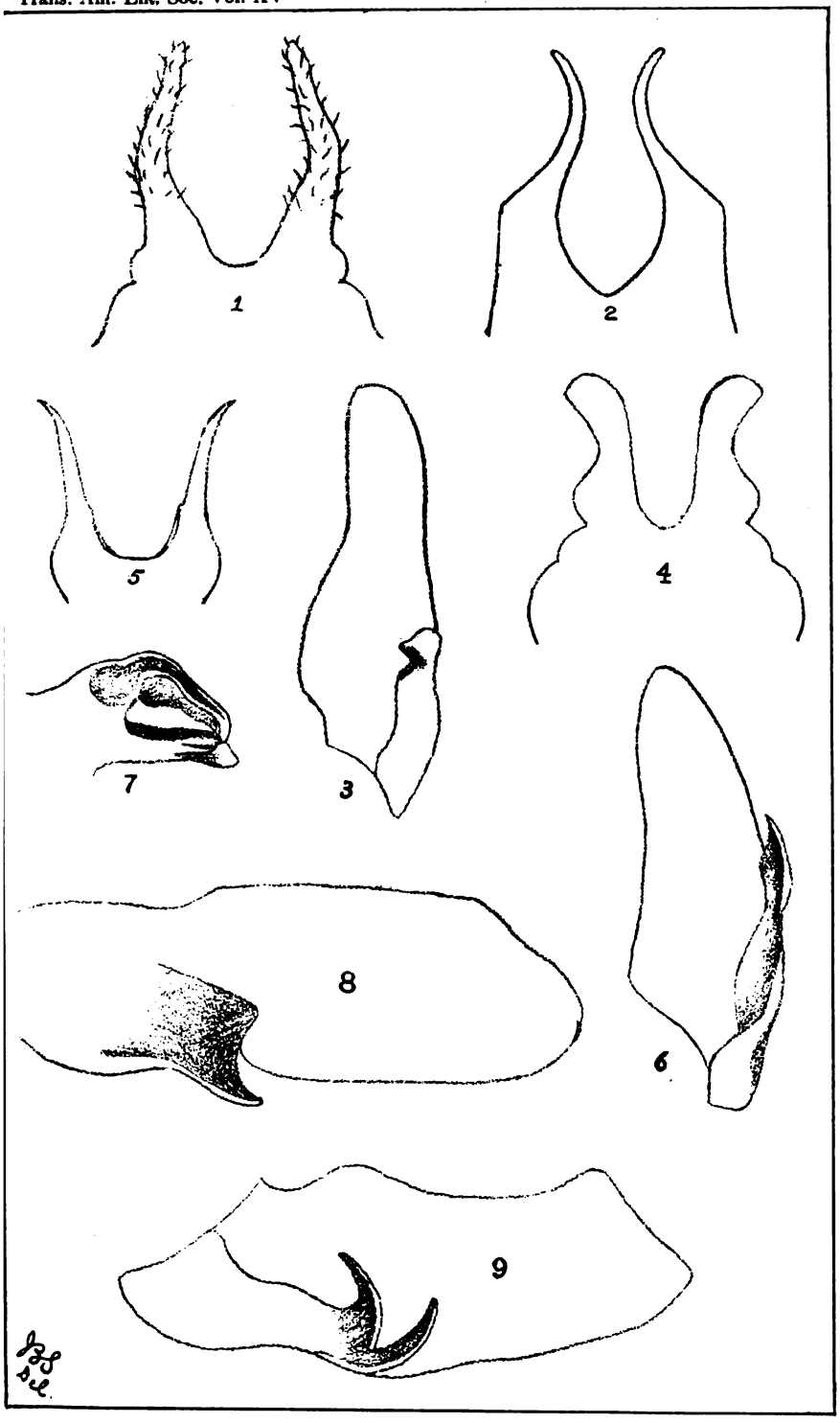

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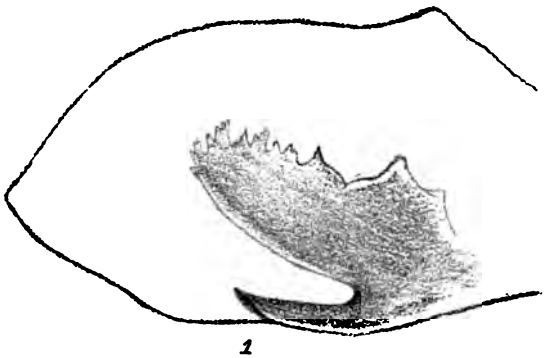

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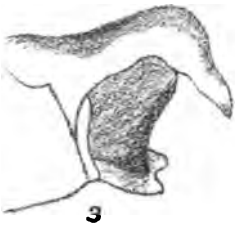

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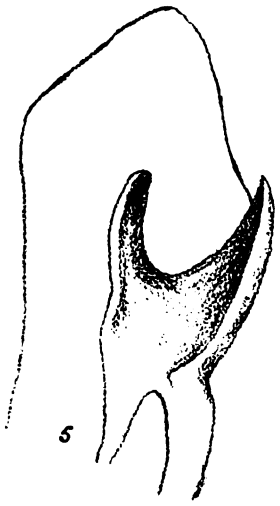

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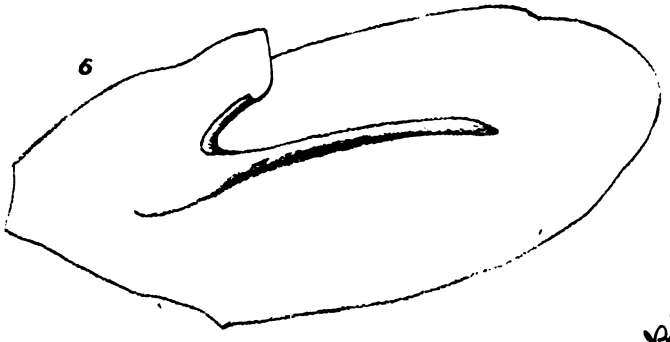

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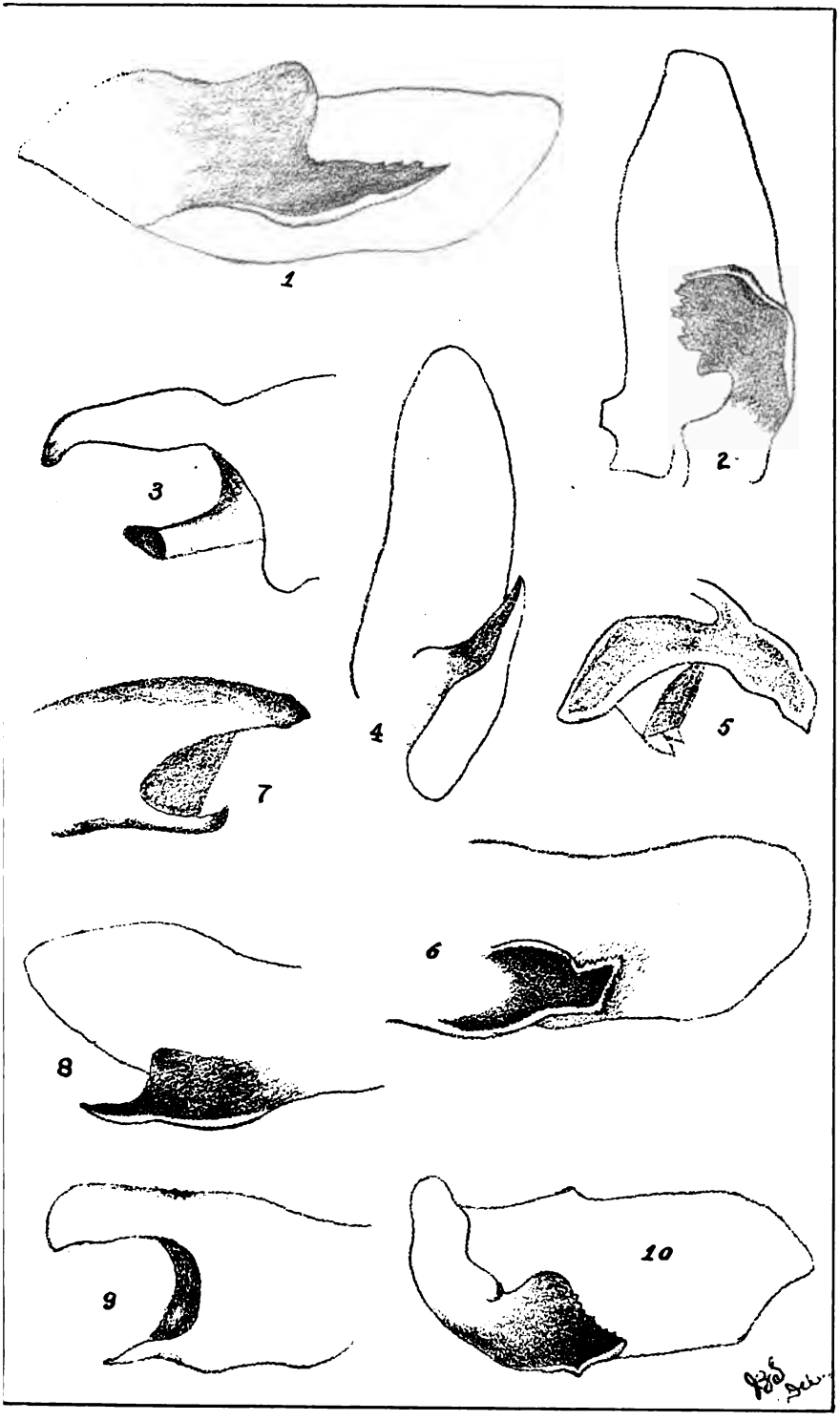

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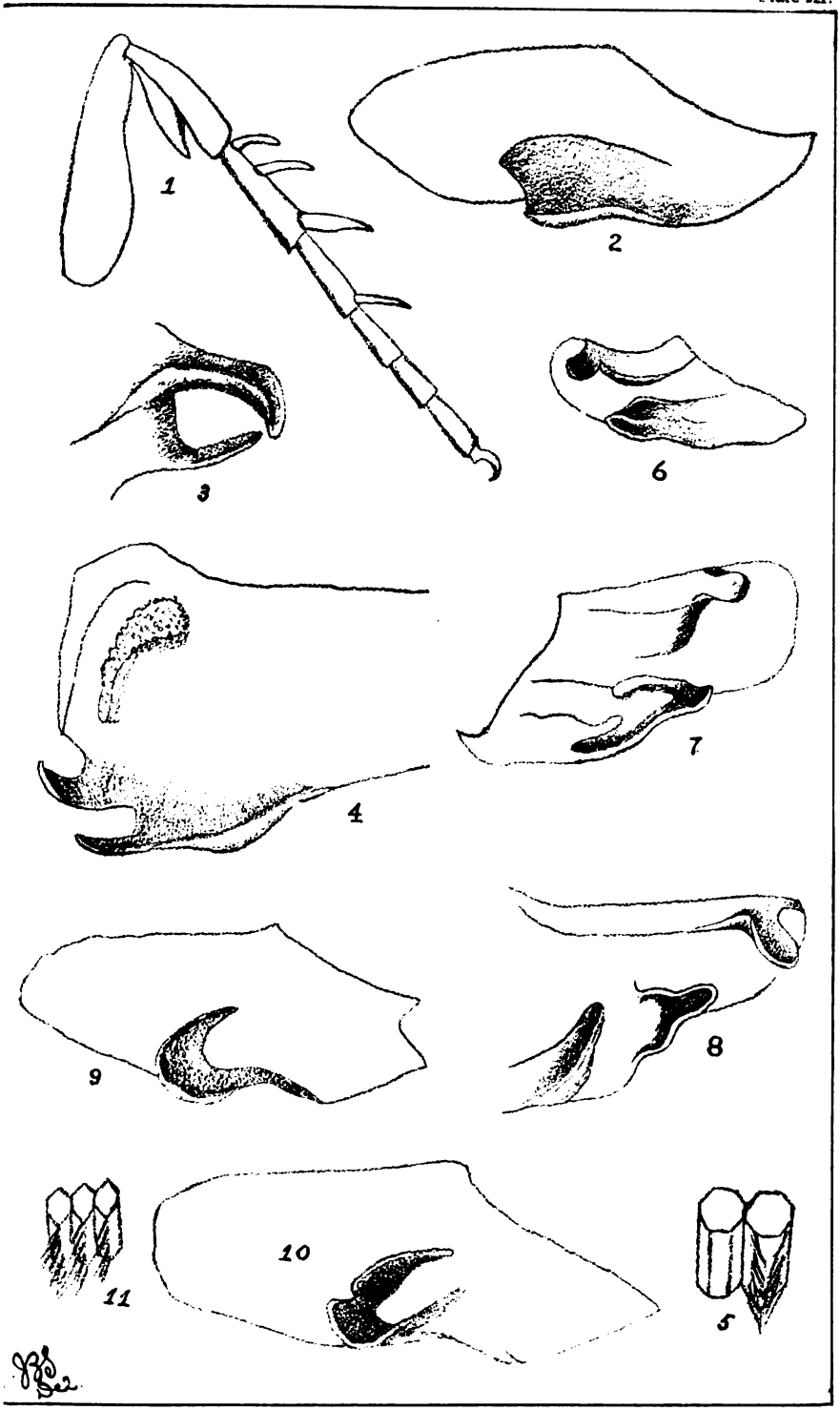

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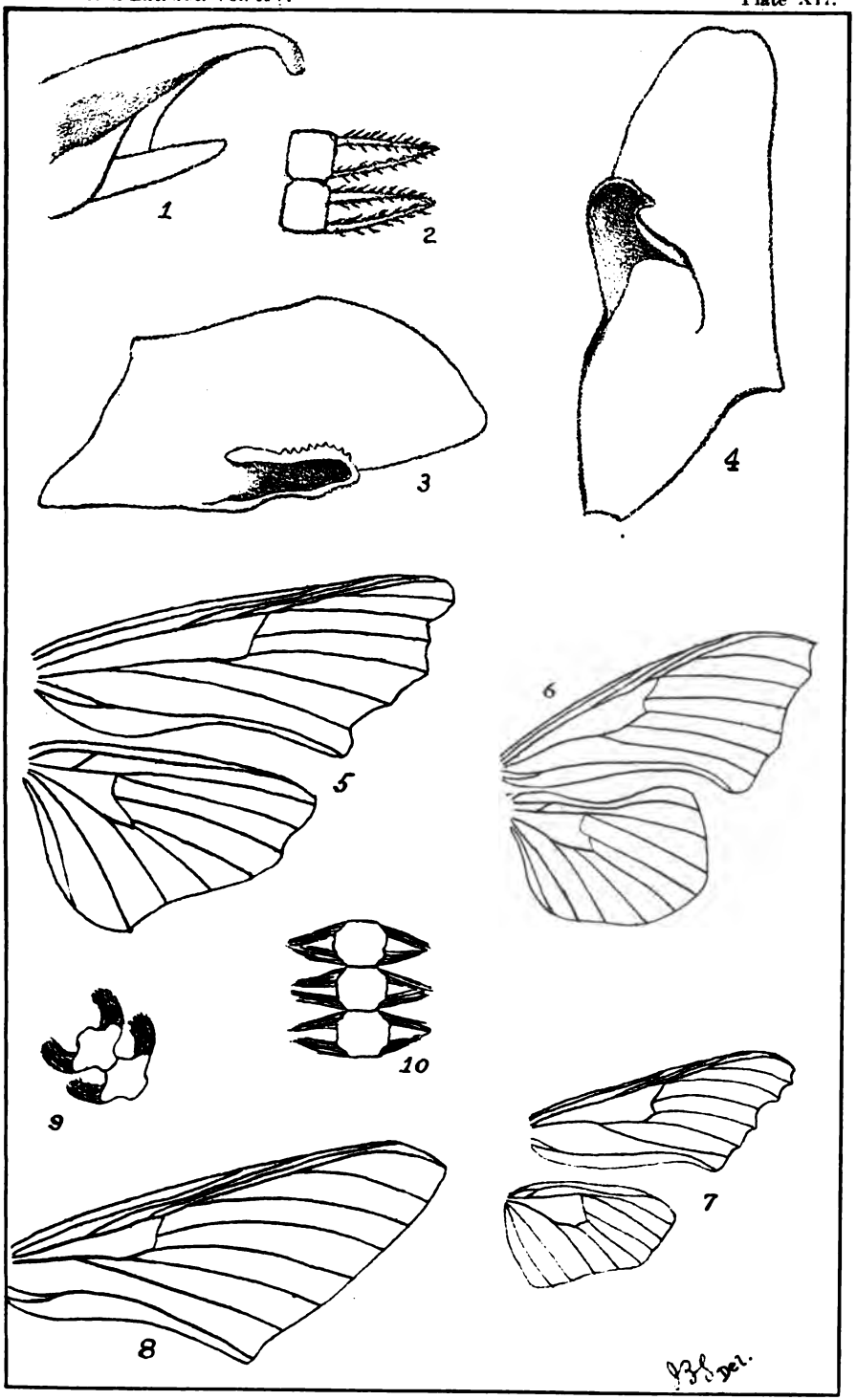

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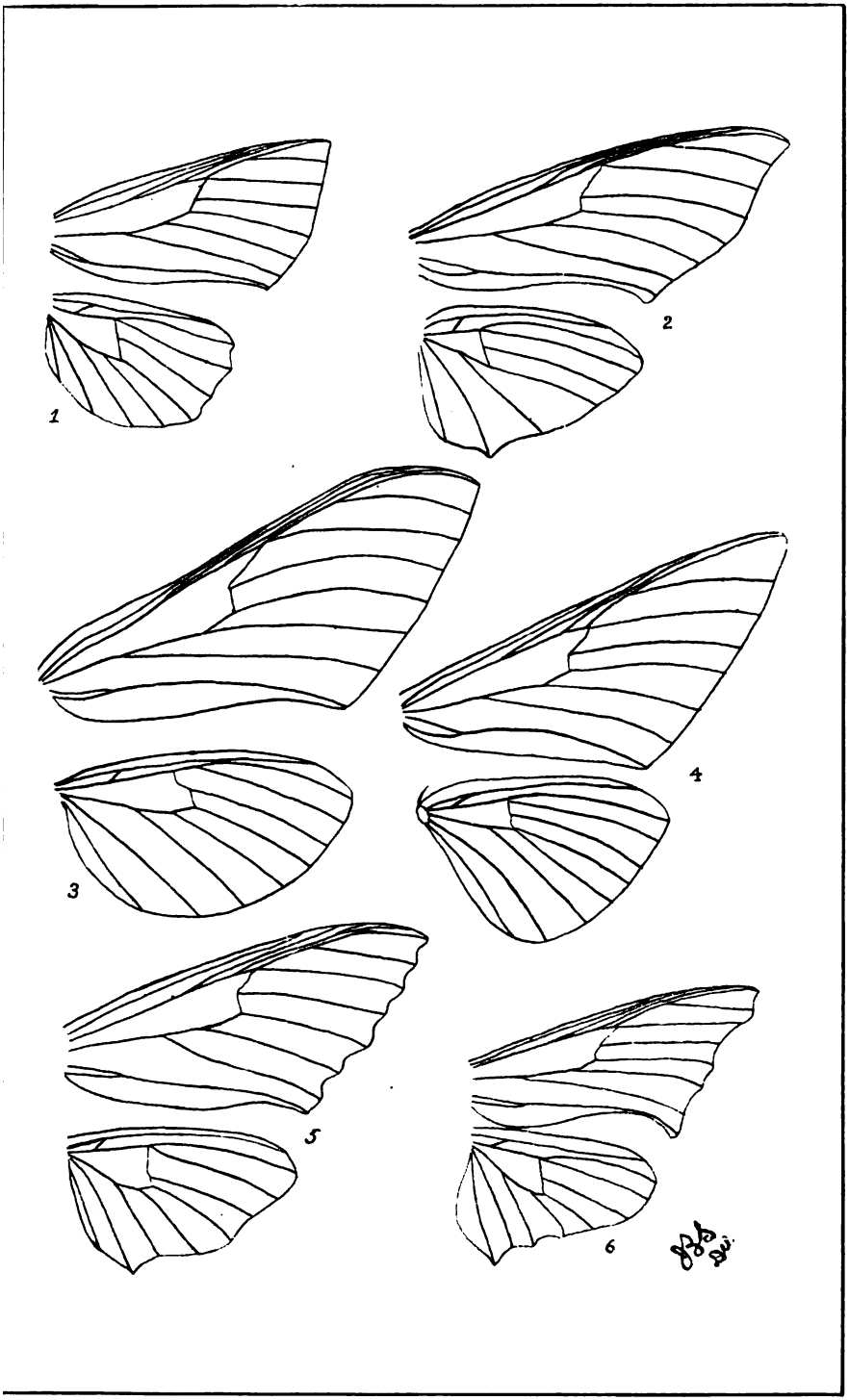

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